LG TRAINING CENTER

Training Manual

50PQ30 Plasma Display

Scan Troubleshooting



LG
Life's Good

Published November 05th, 2009

Overview of Topics to be Discussed

Section 1

Contact Information, Preliminary Matters, Specifications, Plasma Overview, General Troubleshooting Steps, Disassembly Instructions, Voltage and Signal Distribution

Section 2

Circuit Board Operation, Troubleshooting and Alignment of :

- Switch mode Power Supply
- Y-SUS Board Delivers Logic Signals and FG5V to both upper and lower boards.
- Y-Drive Boards (2) Upper and Lower. Lower board delivers Scan to Upper
- Z-SUS Output Board (Also uses one Z-SUB board for bottom panel connector)
- Control Board
- X Drive Boards (3)
- Main Board
- Main Power Switch (Version 3). Shuts off stand by 5V.

50PQ30 Plasma Display

Section 1

This Section will cover Contact Information and remind the Technician of Important Safety Precautions for the Customers Safety as well as the Technician and the Equipment.

Basic Troubleshooting Techniques which can save time and money sometimes can be overlooked. These techniques will also be presented.

This Section will get the Technician familiar with the Disassembly, Identification and Layout of the Plasma Display Panel.

At the end of this Section the Technician should be able to Identify the Circuit Boards and have the ability and knowledge necessary to safely remove and replace any Circuit Board or Assembly.

IMPORTANT SAFETY NOTICE

The information in this training manual is intended for use by persons possessing an adequate background in electrical equipment, electronic devices, and mechanical systems. In any attempt to repair a major Product, personal injury and property damage can result. The manufacturer or seller maintains no liability for the interpretation of this information, nor can it assume any liability in conjunction with its use. When servicing this product, under no circumstances should the original design be modified or altered without permission from LG Electronics. Unauthorized modifications will not only void the warranty, but may lead to property damage or user injury.
If wires, screws, clips, straps, nuts, or washers used to complete a ground path are removed for service, they must be returned to their original positions and properly fastened.

CAUTION

To avoid personal injury, disconnect the power before servicing this product. If electrical power is required for diagnosis or test purposes, disconnect the power immediately after performing the necessary checks. Also be aware that many household products present a weight hazard. At least two people should be involved in the installation or servicing of such devices.
Failure to consider the weight of an product could result in physical injury.

LG CONTACT INFORMATION

Customer Service (and Part Sales)	**(800) 243-0000**
Technical Support (and Part Sales)	**(800) 847-7597**
USA Website (GCSC)	**aic.lgservice.com**
Customer Service Website	**us.lgservice.com**
LG Web Training	**lge.webex.com**
LG CS Academy	**lgcsacademy.com**

http://136.166.4.200
LG Learning Academy

LCD-DV:	**32LG40, 32LH30, 37LH55, 42LG60, 42LG70, 42LH20, 42LH40, 42LH50, 47LG90**
PLASMA:	**42PG20, 42PQ20, 50PQ30, 50PG20, 50PS80, 50PS60**

Also available on the Plasma page

Plasma Panel Alignment Handbook

New Training Materials on the Learning Academy site

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LG Electronics Alabama, Inc.
201 James Record Road, Huntsville, AL, 35813.

ESD Notice (Electrostatic Static Discharge)

Today's sophisticated electronics are electrostatic discharge (ESD) sensitive. ESD can weaken or damage the electronics in a manner that renders them inoperative or reduces the time until their next failure. Connect an ESD wrist strap to a ground connection point or unpainted metal in the product. Alternatively, you can touch your finger repeatedly to a ground connection point or unpainted metal in the product. Before removing a replacement part from its package, touch the anti-static bag to a ground connection point or unpainted metal in the product. Handle the electronic control assembly by its edges only. When repackaging a failed electronic control assembly in an anti-static bag, observe these same precautions.

Regulatory Information

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential installation. This equipment generates, uses, and can radiate radio frequency energy, and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures: Reorient or relocate the receiving antenna; Increase the separation between the equipment and the receiver; Connect the equipment to an outlet on a different circuit than that to which the receiver is connected; or consult the dealer or an experienced radio/TV technician for help.

Safety and Handling, Checking Points

Safety & Handling Regulations

1. Approximately 10 minute pre-run time is required before any adjustments are performed.
2. Refer to the Voltage Sticker inside the Panel when making adjustments on the Power Supply, Y-SUS and Z-SUS Boards.
3. Always adjust to the specified voltage level (+/- ½ volt) unless otherwise specified.
4. Be cautious of electric shock from the PDP module since the PDP module uses high voltage, check that the Power Supply and Drive Circuits are completely discharged because of residual current stored before Circuit Board removal.
4. C-MOS circuits are used extensively for processing the Drive Signals and should be protected from static electricity.
5. The PDP Module must be carried by two people. **Always carry vertical NOT horizontal.**
6. **The Plasma television should be transported vertically NOT horizontally.**
7. Exercise care when making voltage and waveform checks to prevent costly short circuits from damaging the unit.
8. Be cautious of lost screws and other metal objects to prevent a possible short in the circuitry.
9. **New Panels and Frames are much thinner than previous models. Be Careful with flexing these panels. Be careful with lifting Panels from a horizontal position. Damage to the Frame mounts or panel can occur.**
10. **New Plasma models have much thinner cabinet assemblies and mounts. Be extremely careful when moving the set around as damage can occur.**

Checking Points to be Considered

1. Check the appearance of the Replacement Panel and Circuit Boards for both physical damage and part number accuracy.
2. Check the model label. Verify model names and board model matches.
3. Check details of defective condition and history. Example: Y Board Failure, Mal-discharge on screen, etc.

Basic Troubleshooting Steps

Define, Localize, Isolate and Correct

- **Define** Look at the symptom carefully and determine what circuits could be causing the failure. Use your senses Sight, Smell, Touch and Hearing. Look for burned parts and check for possible overheated components. Capacitors will sometimes leak dielectric material and give off a distinct odor. Frequency of power supplies will change with the load, or listen for relay closing etc. **Observation of the front Power LEDs may give some clues.**

- **Localize** After carefully checking the symptom and determining the circuits to be checked and after giving a thorough examination using your senses the first check should always be the DC Supply Voltages to those circuits under test. Always confirm the supplies are not only the proper level but be sure they are noise free. If the supplies are missing check the resistance for possible short circuits.

- **Isolate** To further isolate the failure, check for the proper waveforms with the Oscilloscope to make a final determination of the failure. Look for correct Amplitude Phasing and Timing of the signals also check for the proper Duty Cycle of the signals. Sometimes “glitches” or “road bumps” will be an indication of an imminent failure.

- **Correct** The final step is to correct the problem. Be careful of ESD and make sure to check the DC Supplies for proper levels. Make all necessary adjustments and lastly always perform a Safety AC Leakage Test before returning the product back to the Customer.

50PQ30 PRODUCT INFORMATION SECTION



This section of the manual will discuss the specifications of the 50PQ30 Advanced Single Scan Plasma Display Television.

720P PLASMA HDTV

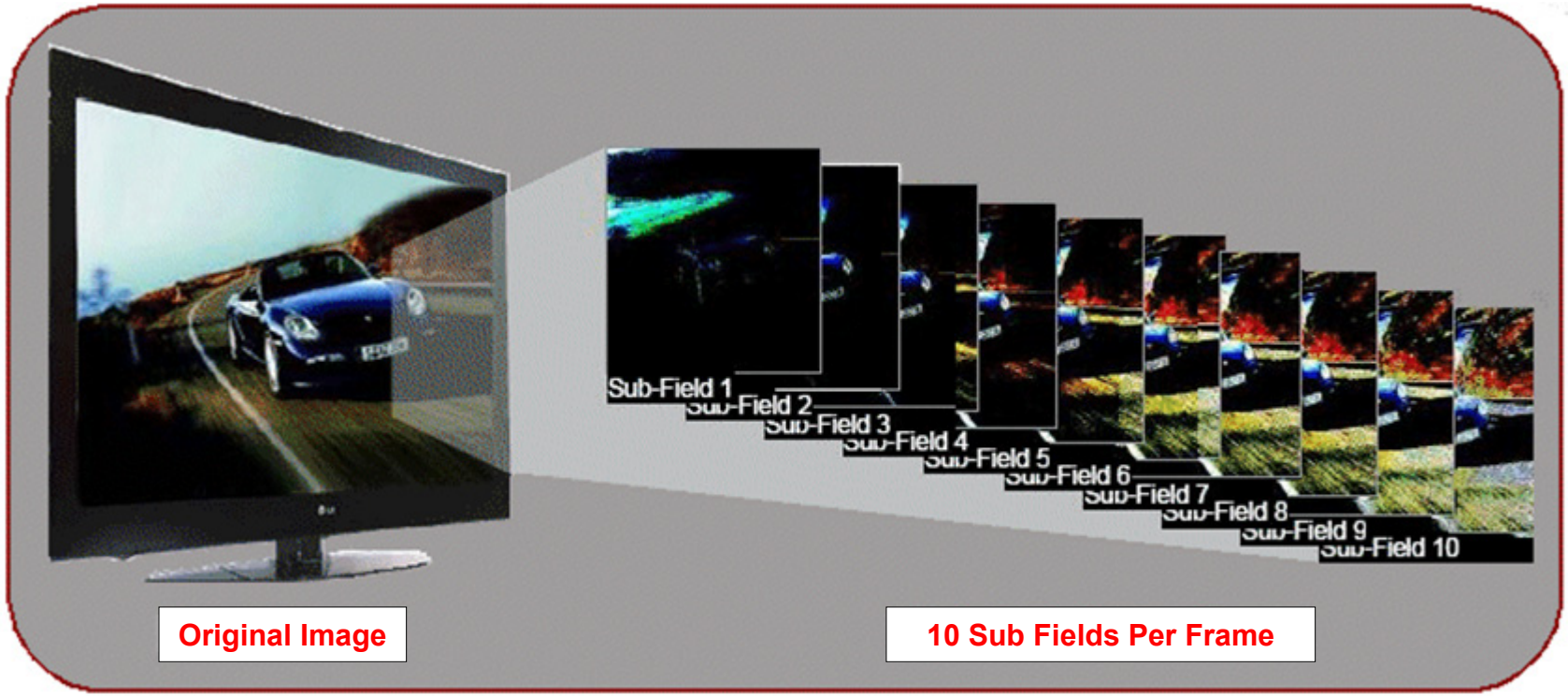
50” Class (50” diagonal)

- 720p HD Resolution
- 600 Hz sub field driving
- 1,500 cd/m2 Brightness
- Dual XD Engine™
- 2000,000:1 Dynamic Contrast Ratio
- Smart Energy Saving
- 3x HDMI™ V.1.3 with Deep Color (2 Rear, 1 side).
- AV Mode (Cinema, Sports, Game)
- Clear Voice
- LG SimpLink™ Connectivity
- Invisible Speaker System
- 100,000 Hours to Half Brightness (Typical)
- PC Input

(600 Hz Sub Field Driving)

- **600 Hz Sub Field Driving is achieved by using 10 sub-fields per frame process (vs. Comp. 8 sub-field/frame)**

- **No smeared images during fast motion scenes**



Sub Field firing occurs using wall charge and polarity differences between Y-SUS and Z-SUS signals.

Specifications Logo Familiarization (Picture Wizard)

Picture Wizard easily guides consumers through the calibration process using on-screen reference points.

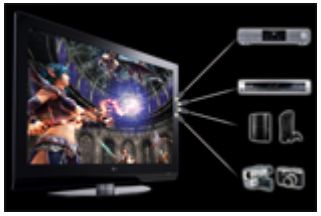
Customers can customize picture performance without the need for additional expense.



50PQ30 Logo Familiarization Page 1 of 2

HD RESOLUTION 720p HD Resolution Pixels: 1365 (H) × 768 (V)
High definition television is the highest performance segment of the DTV system used in the US. It's a wide screen, high-resolution video image, coupled with multi-channel, compact-disc quality sound.

HDMI (1.3 Deep Color) Digital multi-connectivity
HDMI (1.3 Deep color) provides a wider bandwidth (340MHz, 10.2Gbps) than that of HDMI 1.2, delivering a broader range of colors, and also drastically improves the data-transmission speed.



Invisible Speaker
Personally tuned by Mr. Mark Levinson for LG
TAKE IT TO THE EDGE newly introduces 'Invisible Speaker' system, guaranteeing first class audio quality personally tuned by Mr. Mark Levinson, world renowned as an audio authority. It provides Full Sweet Spot and realistic sound equal to that of theaters with its Invisible Speaker.



Dual XD Engine
Realizing optimal quality for all images
One XD Engine optimizes the images from RF signals as another XD Engine optimizes them from External inputs. Dual XD Engine presents images with optimal quality two times higher than those of previous models.



50PQ30 Logo Familiarization Page 2 of 2



AV Mode "One click" Cinema, THX Cinema, Sport, Game mode.
TAKE IT TO THE EDGE is a true multimedia TV with an AV Mode which allows you to choose from 4 different modes of Cinema, Sports and Game by a single click of a remote control.



Clear Voice Clearer dialogue sound
Automatically enhances and amplifies the sound of the human voice frequency range to provide high-quality dialogue when background noise swells.



Save Energy, Save Money
It reduces the plasma display's power consumption.
The default factory setting complies with the Energy Star requirements and is adjusted to the comfortable level to be viewed at home.
(Turns on Intelligent Sensor).



Save Energy, Save Money
Home electronic products use energy when they're off to power features like clock displays and remote controls. Those that have earned the ENERGY STAR use as much as 60% less energy to perform these functions, while providing the same performance at the same price as less-efficient models. Less energy means you pay less on your energy bill. Draws less than 1 Watt in stand by.

50PQ30 Remote Control

TOP PORTION

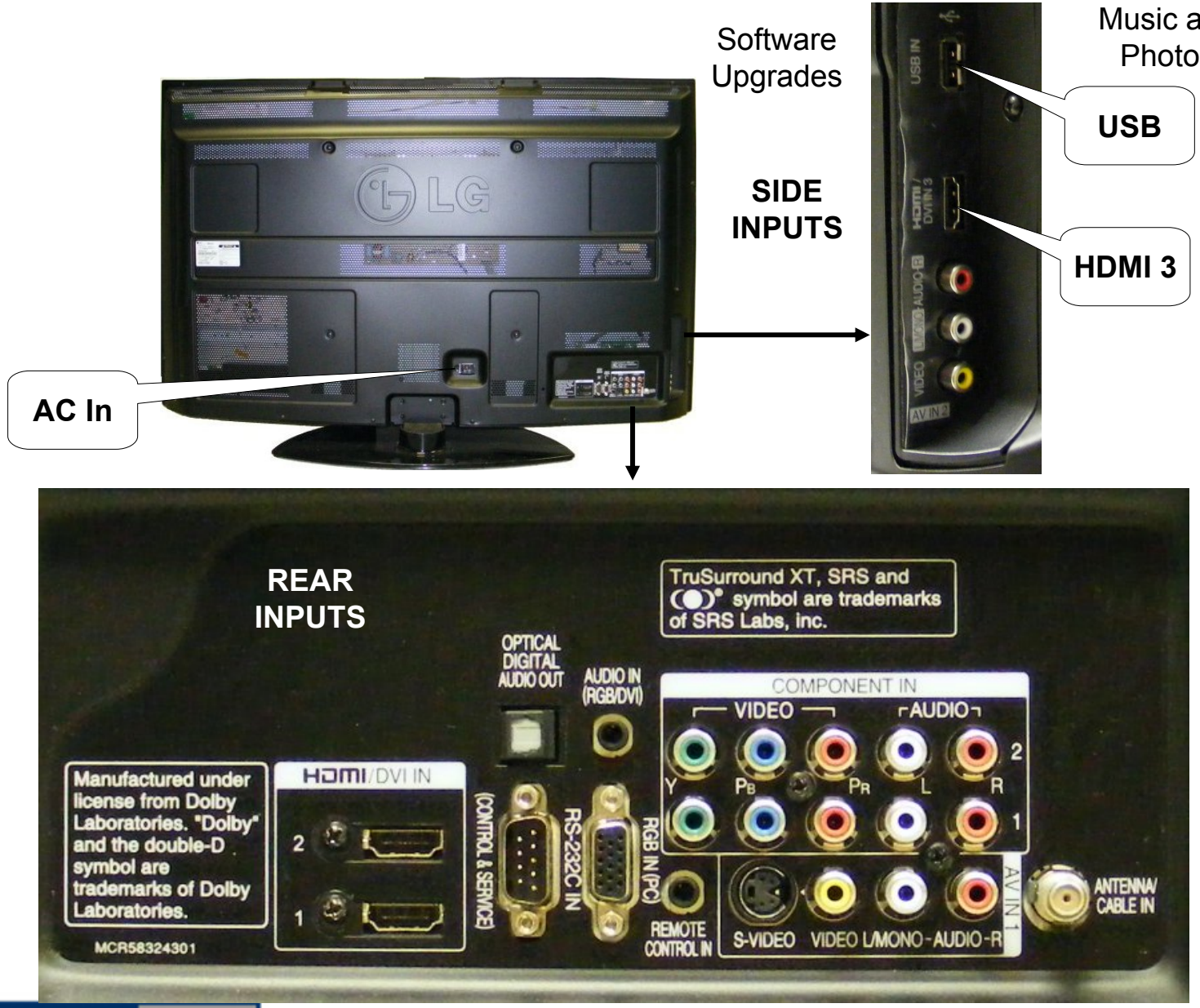




BOTTOM PORTION



50PQ30 Rear and Side Input Jacks

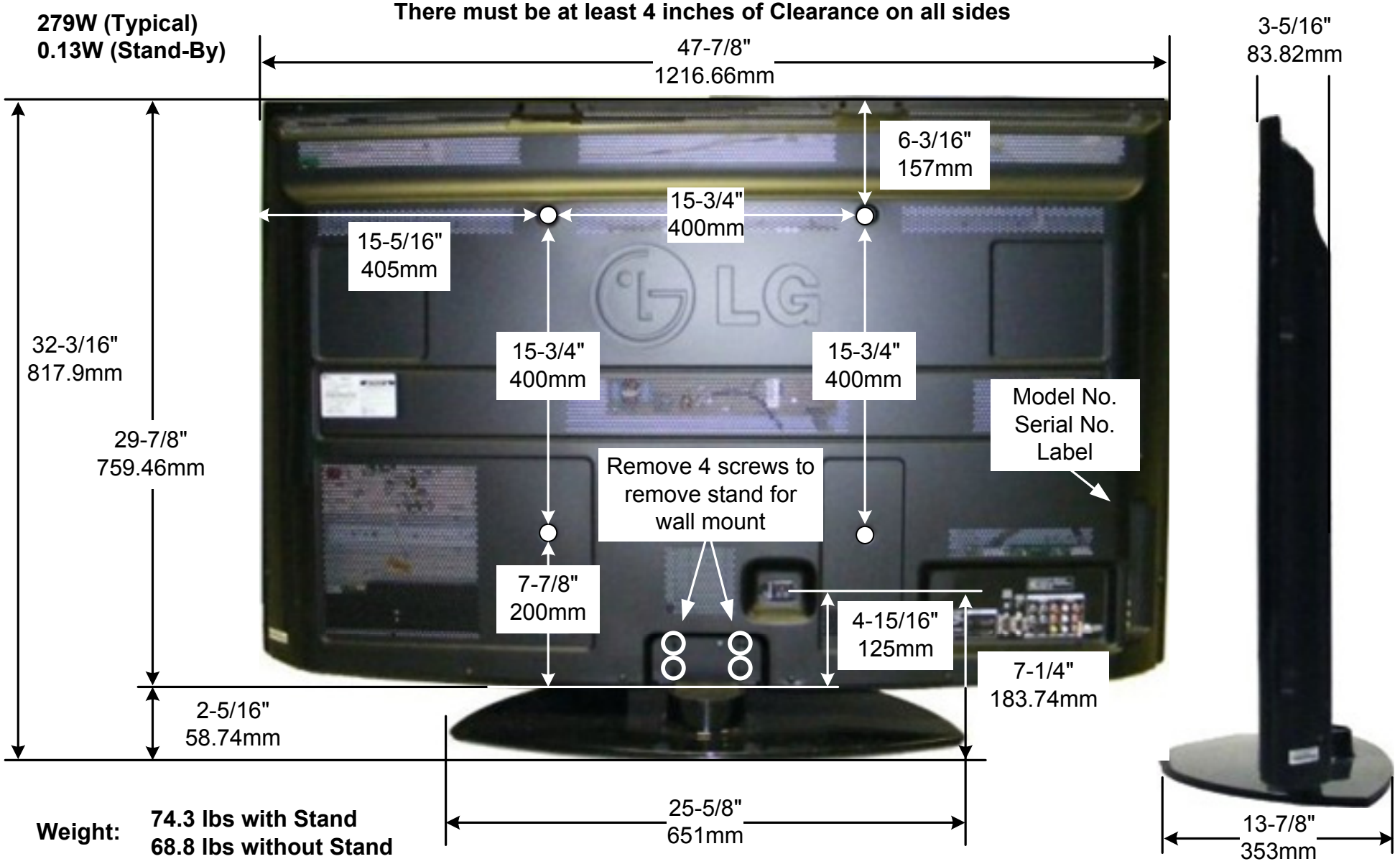


50PQ30 Dimensions

Power:

279W (Typical)
0.13W (Stand-By)

There must be at least 4 inches of Clearance on all sides



Weight: **74.3 lbs with Stand**
68.8 lbs without Stand

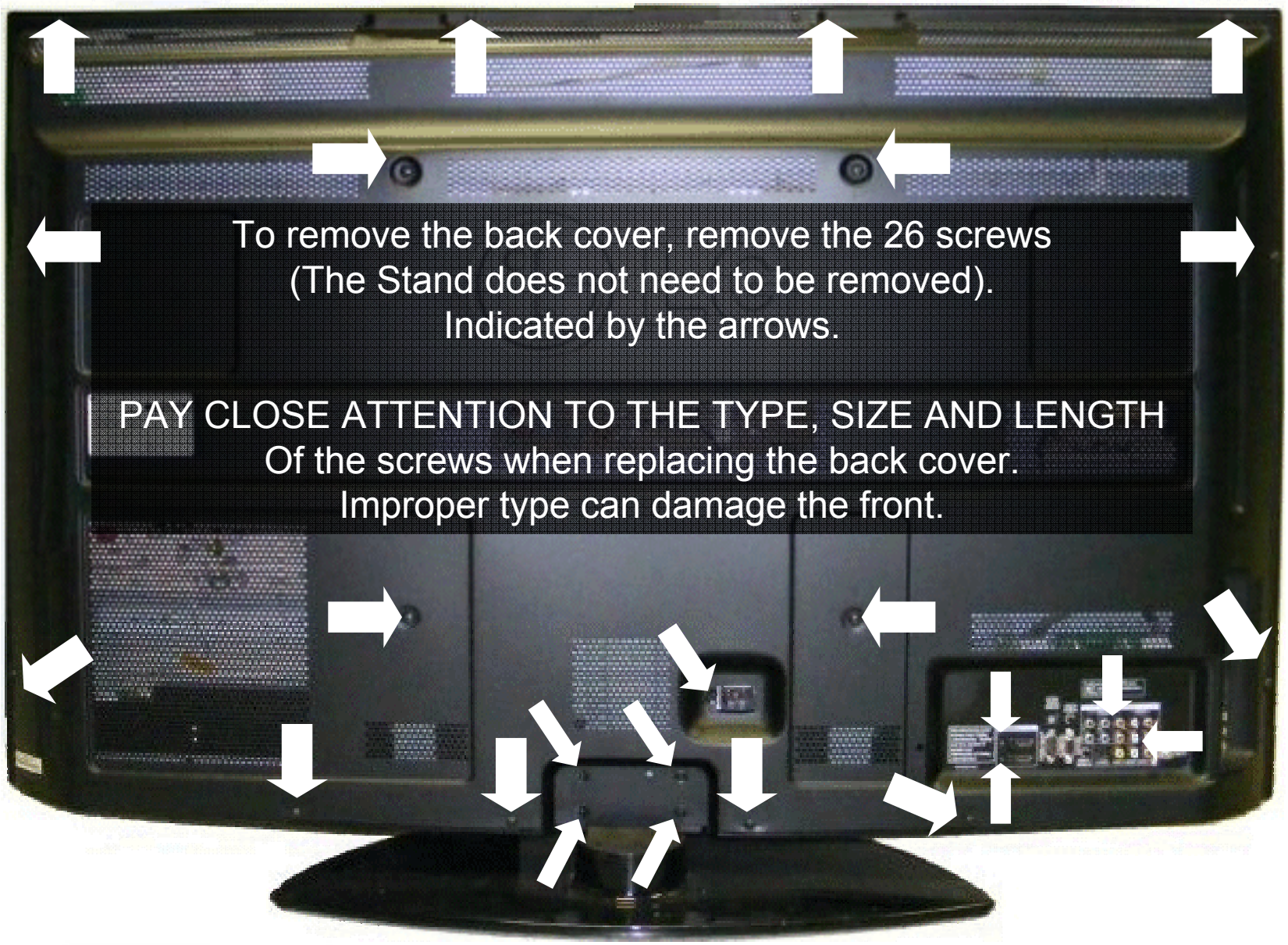
DISASSEMBLY SECTION



This section of the manual will discuss Disassembly, Layout and Circuit Board Identification, of the 50PQ30 Advanced Single Scan Plasma Display Panel.

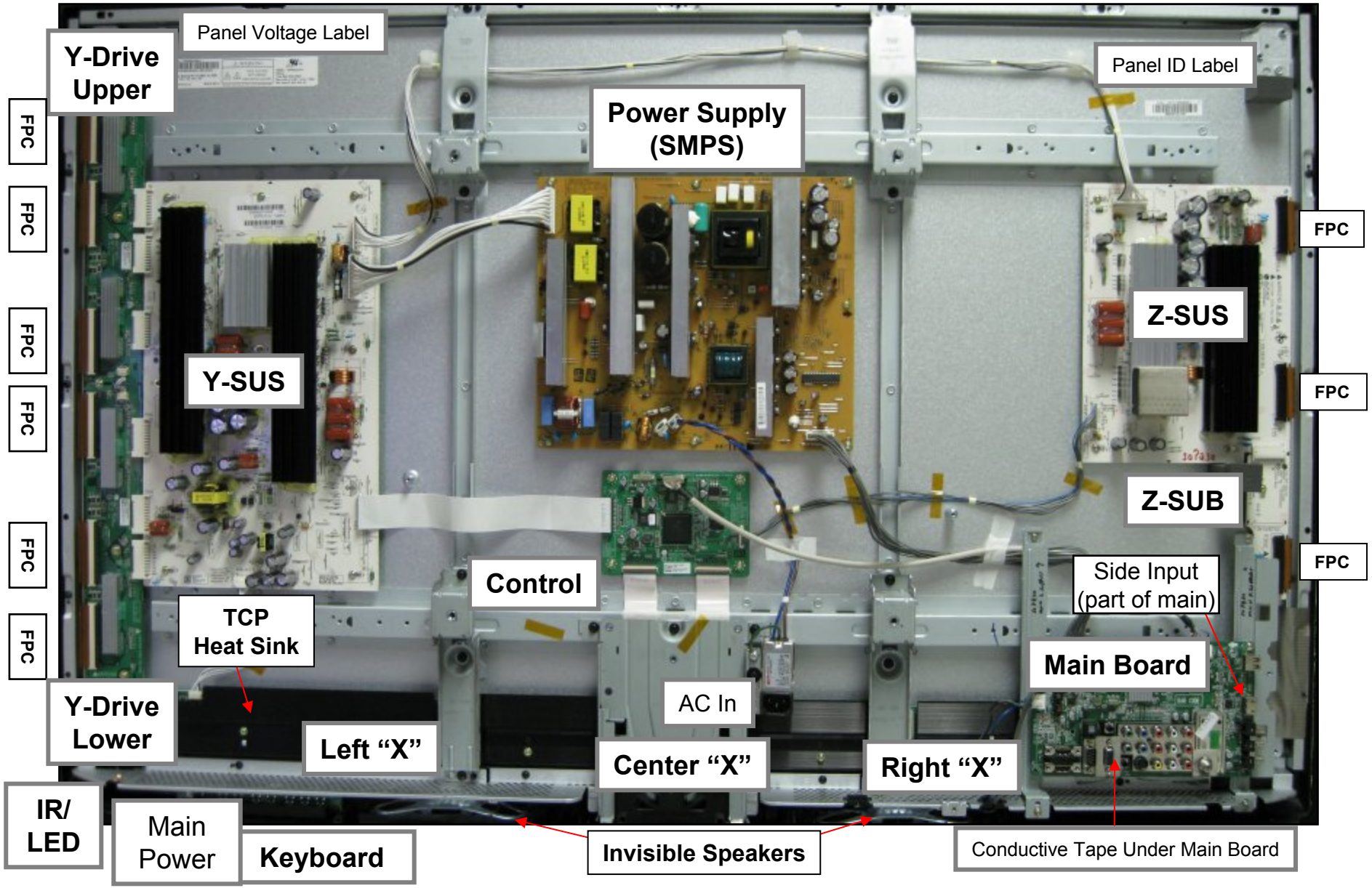
Upon completion of this section the Technician will have a better understanding of the disassembly procedures, the layout of the printed circuit boards and be able to identify each board.

Removing the Back Cover



Circuit Board Layout

Identify the Circuit Boards



Disassembly Procedure for Circuit Board Removal

Notes: 1) All Plugs listed are from left to right Pin 1,2, 3, ETC.
2) Remember to be cautious of ESD as some semiconductors are CMOS and prone to static failure.

Switch Mode Power Supply Board Removal

Disconnect the following connectors: P811, P813, SC101.
Remove the 8 screws holding the SMPS in place.
Remove the board.
When replacing, be sure to readjust the Va/Vs voltages in accordance with the Panel Label.
Also, re-confirm VSC, -Vy and Z-Bias as well.

Y-SUS Board Removal

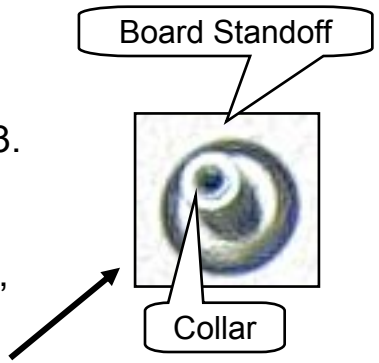
After replacing the Y-Drive, check the connectors for solder break.

Disconnect the following connectors: P201, P206, P101, P202.
Remove the 8 screws holding the Y-SUS in place.
Remove the Y-SUS by lifting slightly to clear standoff and slid it to the right.
When replacing, be sure to readjust the Va/Vs voltages in accordance with the Panel Label.
Confirm VSC, -Vy and Z-bias as well.

Y-Drive Boards Removal

After replacing the Y-Drive, check the connectors for solder breaks.

Disconnect the following Flexible Ribbon Connectors: P101~P103 and/or P201~P203.
Disconnect the following connectors: P209 and/or P108.
Remove the 3 screws holding either of the Y-Drive boards in place.
Remove the Y-Drive by lifting slightly and sliding the board to the left unseating P106, P107, P109 and/or P205, P206 and P208 from the Y-SUS Board.



Note: Y, Z-SUS and Y-Drive boards are mounted on board stand-offs that have a small collar. The board must be lifted slightly to clear these collars.

Disassembly Procedure for Circuit Board Removal (2)

Z-SUS Board Removal

Disconnect the following connectors: P100, P101.
Disconnect the following connectors: P104, P105 and P302. These are the FPC cables. Pull the locking caps to the right. Lift carefully the Flexible Printed Circuits (FPCs) and slide them out to the right.
Remove the 5 screws holding the Z-SUS in place and the one holding the Z-SUB in place.
Lift the Z-SUS up and remove the board. Remove the Z-SUB by pulling it off the Z-SUS.
When replacing, be sure to readjust the Va/Vs voltages in accordance with the Panel Label.
Confirm VS, -Vy and Z-bias as well.

Main Board Removal

Disconnect the following connectors: P1001, P1003, P1005 and P1006.
Remove the 1screws holding on the decorative plastic piece on the right side.
Remove the 4 screws holding the Main board in place and Remove the board.

Control Board Removal

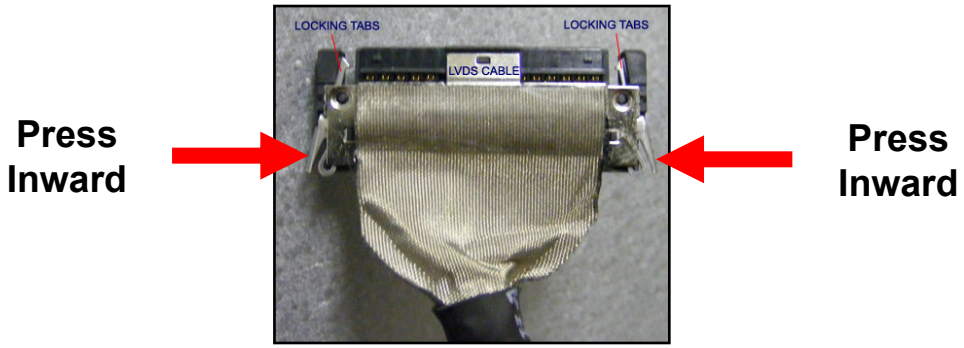
Disconnect the following connectors: P121 LVDS, P101, P161 Ribbon, P162 Ribbon by lifting up the locking tab. Remove the 4 screws holding the Control board in place Remove the board.

Front Key and LED Board Removal

Remove the 2 screws holding the Key board in place. Remove the board by releasing the two black tabs and lifting the board upward. Disconnect P101.
(Note: LED board is behind the Key board. Remove it's 2 screws and remove.
Disconnect J1 and J2.

X Drive Circuit Board Removal Continued

Lay the Plasma down carefully on a padded surface.
Make sure AC is removed and remove the Back Cover and the Stand.
Carefully remove the LVDS Cable **P121** from the Control Board by pressing the Locking Tabs together and pull the connector straight back to remove the cable. (This prevents possible damage). See illustration below.

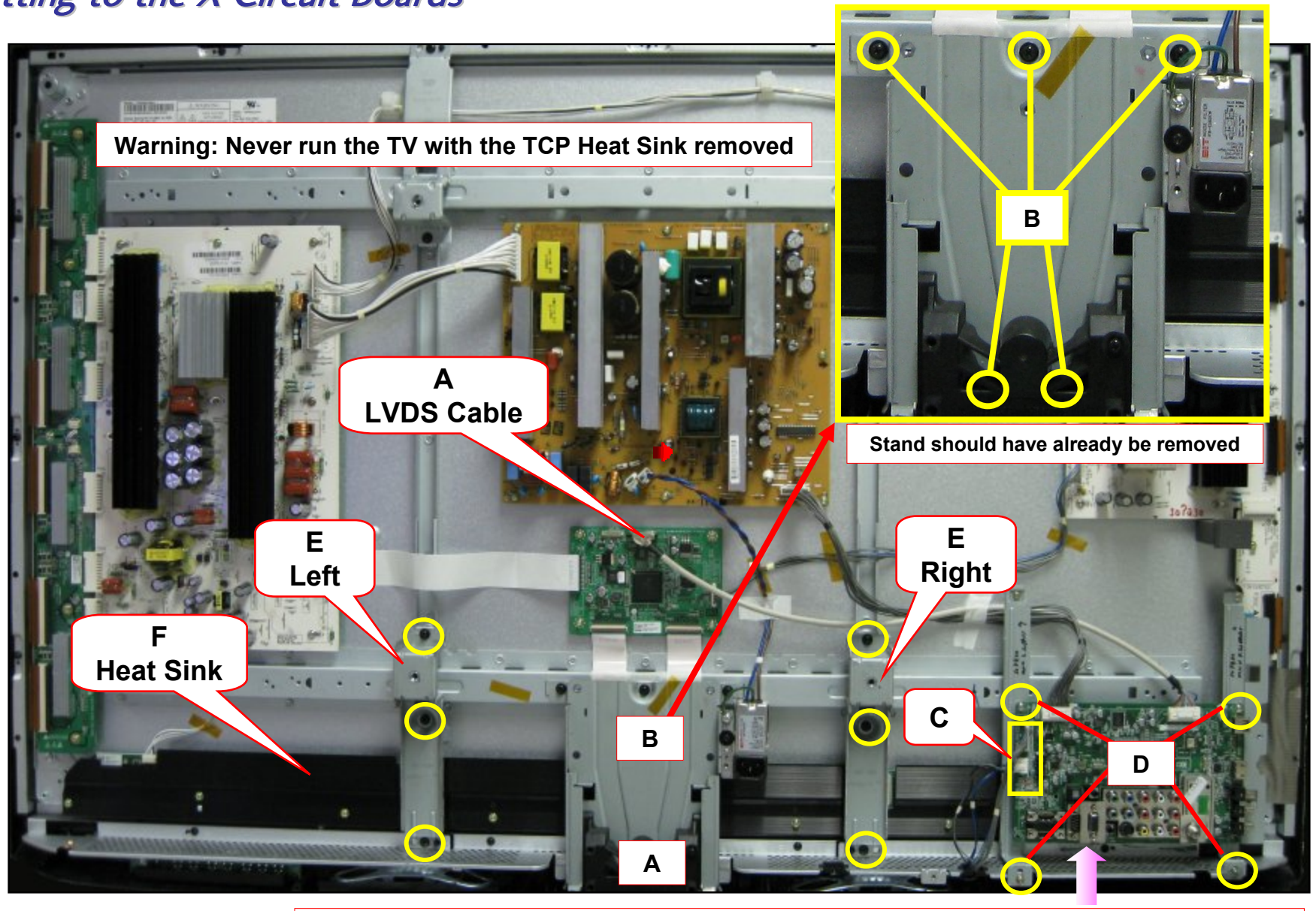


LVDS Cable Connector

(A) Remove the Stand (4 Screws removed during back removal).
(B) Remove the Stand Metal Support Bracket (5 Screws).
(C) Remove connector P1001 to Front IR board and P1005 to the Speakers.
(D) Remove the 4 screws from the Main Board Mounting Bracket. Carefully reposition the Main Board and Mounting Bracket up and off to the right side.
(E) Remove the metal support Braces marked “E”. Note: There is a Left and a Right brace. (3 Screws per/bracket).
(F) Remove the 9 screws holding the Heat Sink. (Warning: Never run the set with this heat sink removed).

X-DRIVE LEFT, CENTER AND RIGHT REMOVAL:
Disconnect all TCP ribbon cables from the defective X-Drive board. Remove the 3 screws in either the Left or Right X-Drive board or the 4 screws holding the Center X-Drive in place.
Remove the board. Reassemble in reverse order. Recheck Va / Vs / VScan / -VY / Z-Drive.

Getting to the X Circuit Boards

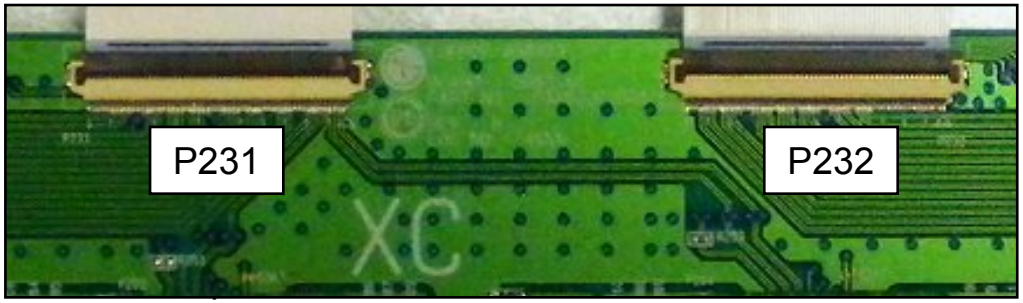


Warning Shorting Hazard: Conductive Tape. Do not allow to touch energized circuits.

Left and Right X Drive Removal

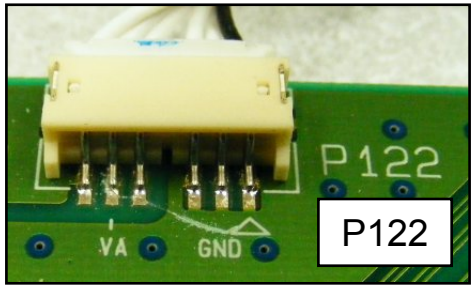
After removing the back cover, the Main board is lifted out of the way, the 9 screws removed from heat sink covering the TCPs and connectors to the TCPs are removed, the X-Drive boards can be removed.

There may be tape on the connectors P231 or P232



Remove tape (if present) and Gently pry the locking mechanism upward and remove the ribbon cable from the connector.

Disconnect connector P122

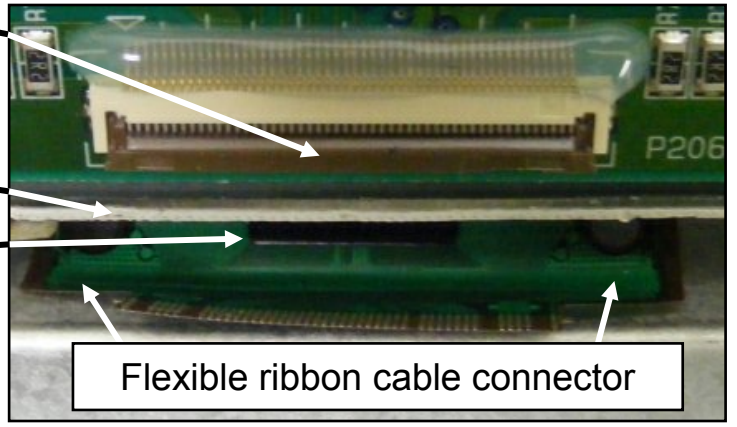


Va from the Y-SUS

Carefully lift the TCP ribbon up and off.
It may stick, be careful not to crack TCP.
(See next page for precautions)

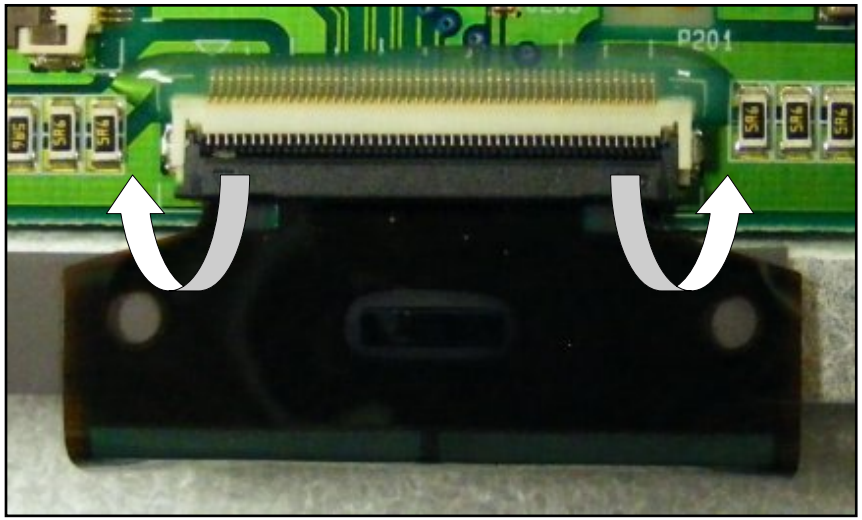
Removing Connectors to the TCPs.

Gently lift the locking mechanism upward on all TCP connectors
Left X: P101~105
Center X: P201~206
Right X: P301~305



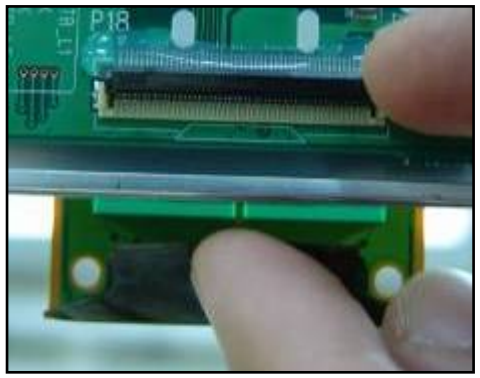
TCP (Tape Carrier Package) Generic Removal Precautions

TCP Connector Removal



Lift up the lock as shown by arrows.
**(The Lock can be easily broken.
It needs to be handled carefully.)**

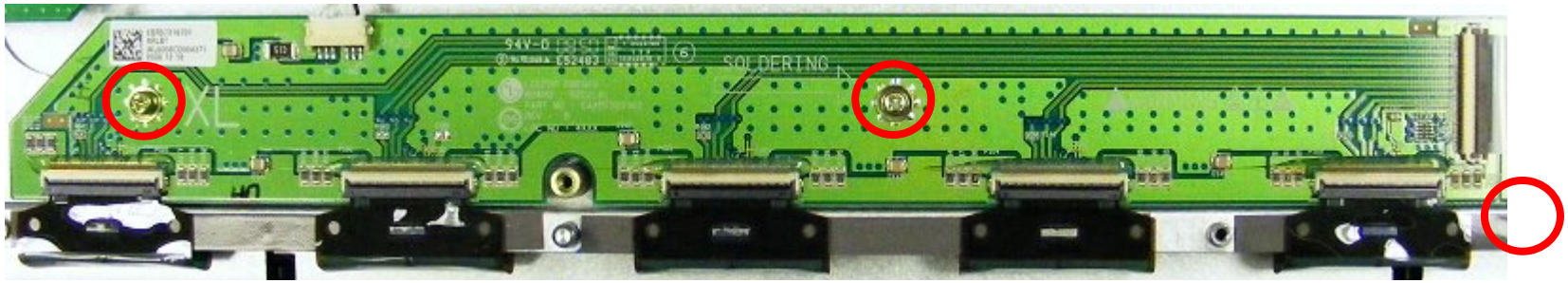
The TCP has two small tab on each side which have to be lifted up slightly to pull the connector out. Note: TCP is usually stuck down to the heat transfer material, be Very careful when lifting up on the TCP ribbon cable.



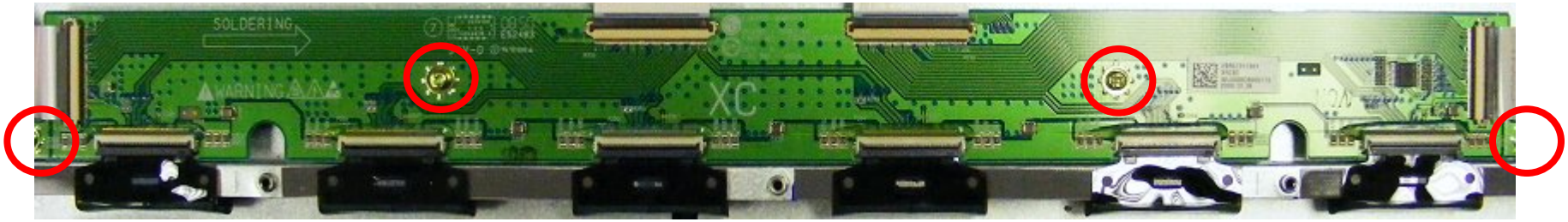
Pull TCP apart as shown by arrow.
**(TCP Film can be easily damaged.
Handle with care.)**

Left and Right X Drive Removal

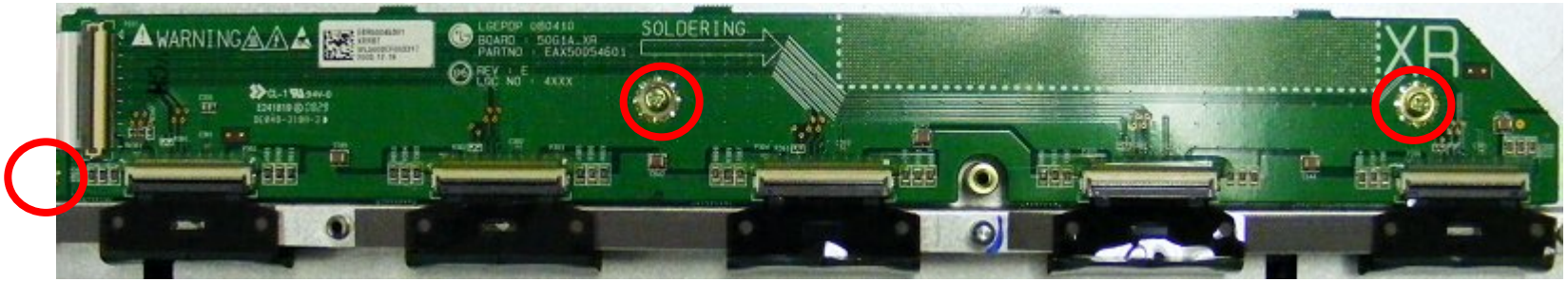
Remove the 3 screws for either left or right board or 4 for the center. 8 total for all three.
(The screws between the boards, secures both boards)



The Left X Board drives the right side of the screen vertical electrodes



The Center X Board drives the Center of the screen vertical electrodes



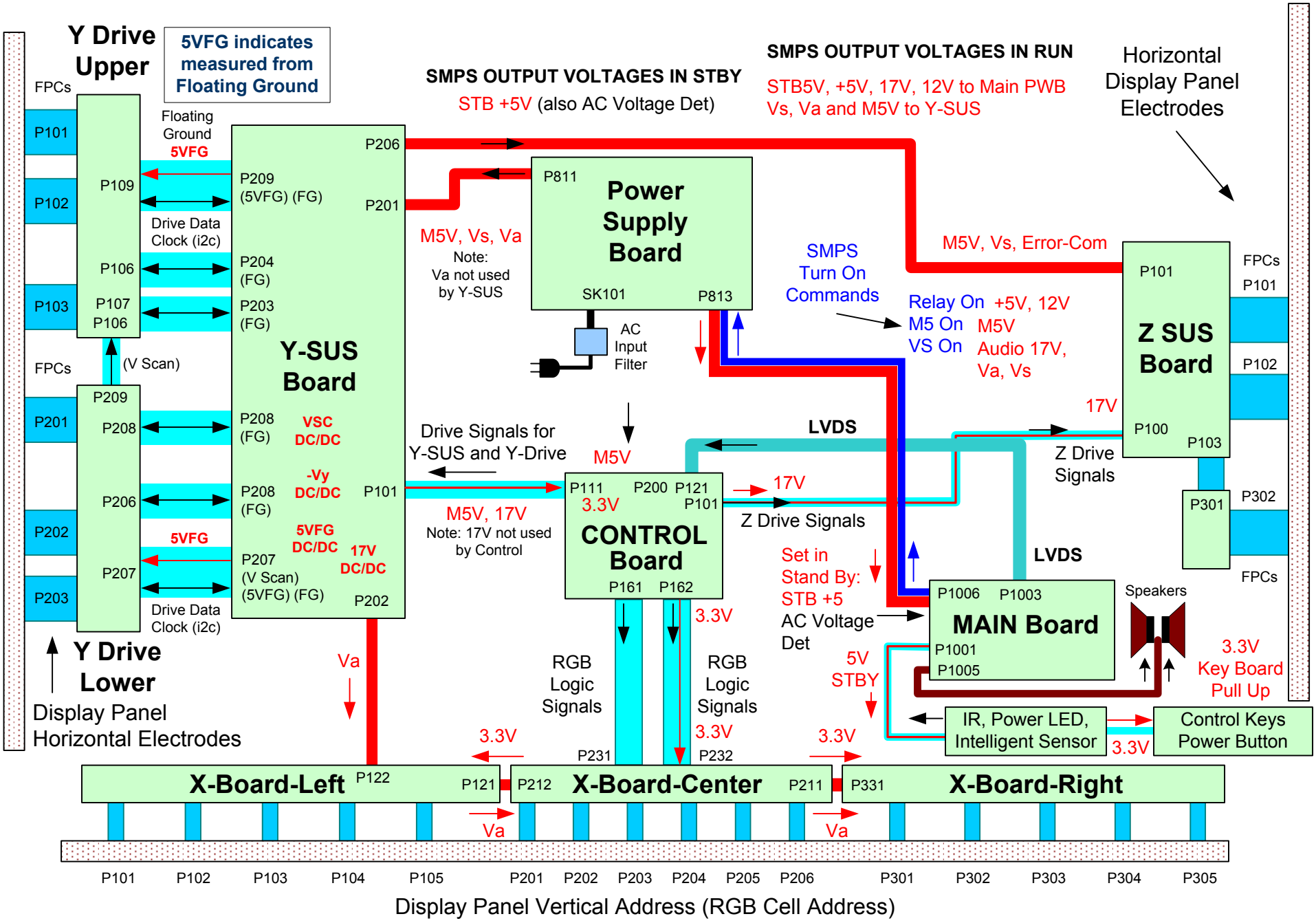
The Right X Board drives the left side of the screen vertical electrodes

50PQ30 Plasma Display

This Section will cover Circuit Operation, Troubleshooting and Alignment of the Power Supply, Y-SUS Board, Y-Drive Boards, Z-SUS Board, Control Board, Main Board and the X Drive Boards.

At the end of this Section the technician should understand the operation of each circuit board and how to adjust the controls. The technician should be able with confidence to troubleshoot a circuit board failure, replace the defective circuit and perform all necessary adjustments.

50PQ30 SIGNAL and VOLTAGE DISTRIBUTION DIAGRAM



Panel Label Explanation



(1) Panel Model Name
(2) Bar Code
(3) Manufacture No.
(4) Adjusting Voltage DC, Va, Vs
(5) Adjusting Voltage (Set Up / -Vy / Vsc / Ve / Vzb)
(6) Trade name of LG Electronics
(7) Manufactured date (Year & Month)
(8) Warning

(9) TUV Approval Mark
(10) UL Approval Mark
(11) UL Approval No.
(12) Panel Model Name
(13) Max. Watt (Full White)
(14) Max. Volts
(15) Max. Amps

Adjustment Notice

All adjustments (DC or Waveform) are adjusted in WHITE WASH.
Customer's Menu, Select "Options", select "ISM" select "WHITE WASH".

It is critical that the DC Voltage adjustments be checked when;

1) SMPS, Y-SUS or Z-SUS board is replaced.
2) Panel is replaced, Check Va/Vs since the SMPS does not come with new panel
3) A Picture issue is encountered
4) As a general rule of thumb when ever the back is removed

ADJUSTMENT ORDER "IMPORTANT"

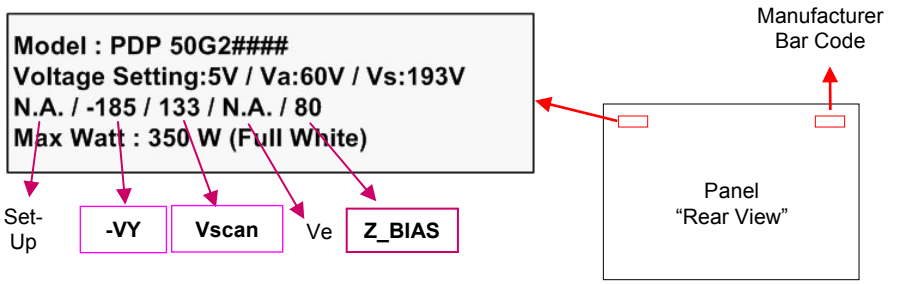
DC VOLTAGE ADJUSTMENTS

1) **POWER SUPPLY: Va Vs** (Always do first)
2) **Y-SUS: Adjust –Vy, Vscan,**
3) **Z-SUS: Adjust Z-Bias (VZB)**

WAVEFORM ADJUSTMENTS

1) **Y-SUS: Set-Up, Set-Down**

Remember, the Voltage Label MUST be followed, it is specific to the panel's needs.



All label references are from a specific panel.
They are not the same for every panel encountered.

The Waveform adjustment is only necessary

1) When the Y-SUS board is replaced
2) When a "Mal-Discharge" problem is encountered
3) When an abnormal picture issues is encountered

SWITCH MODE POWER SUPPLY SECTION

This Section of the Presentation will cover troubleshooting the Switch Mode Power Supply for the Single Scan Plasma. Upon completion of the section the technician will have a better understanding of the operation of the Power Supply Circuit and will be able to locate voltage and test points needed for troubleshooting and alignments.

- DC Voltages developed on the SMPS
- Adjustments VA and VS.

- Always refer to the Voltage Sticker located on the back of the panel, in the upper Left Hand side for the correct voltage levels for the VA, VS, -VY, Vscan, and Z Bias as these voltages will vary from Panel to Panel even in the same size category.
- Set-Up and Ve are just for Label location identification and are not adjusted in this panel.

SMPS P/N EAY58316301

Check the silk screen label on the top center of the Power Supply board to identify the correct part number. (It may vary in your specific model number).

On the following pages, we will examine the Operation of this Power Supply.

50PQ30 50G2 (SMPS) POWER SUPPLY BOARD

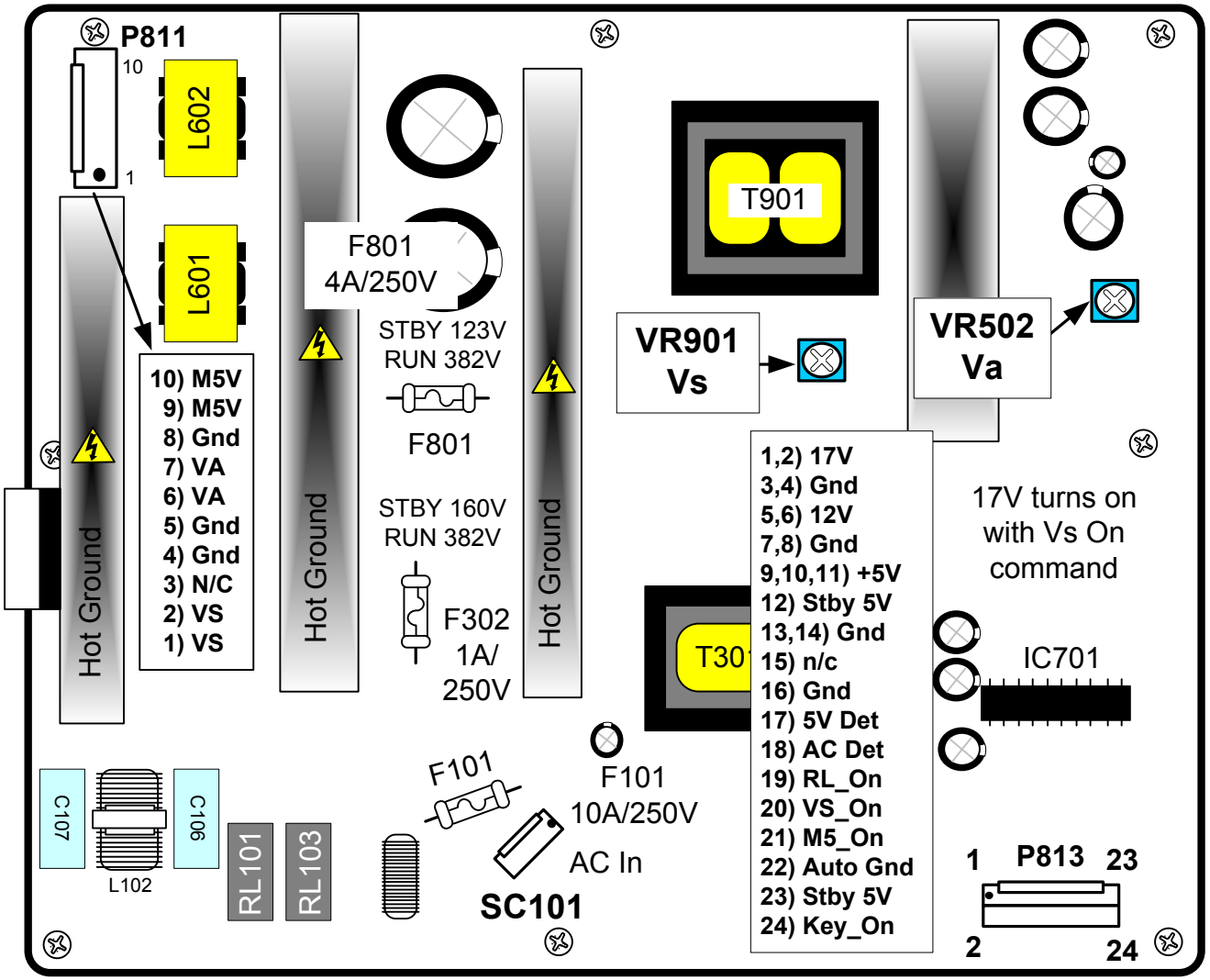
EXAMPLE: Voltage Label. Use the voltage label off your specific panel for adjustments.

Hot Ground Symbol represents a SHOCK Hazard

Model : PDP 50G2####
Voltage Setting:5V / Va:60V / Vs:193V
N.A. / -185 / 133 / N.A. / 80
Max Watt : 350 W (Full White)

VA Adjust VR502

VS Adjust VR901



P813

1	17V	2	17V
3	Gnd	4	Gnd
5	12V	6	12V
7	Gnd	8	Gnd
9	5V	10	5V
11	5V	12	STBY 5V
13	Gnd	14	Gnd
15	Gnd	16	N/C
17	5V Det	18	AC Det
19	RL ON	20	VS ON
21	M5 ON	22	Auto Gnd
23	Stby5V	24	Key On

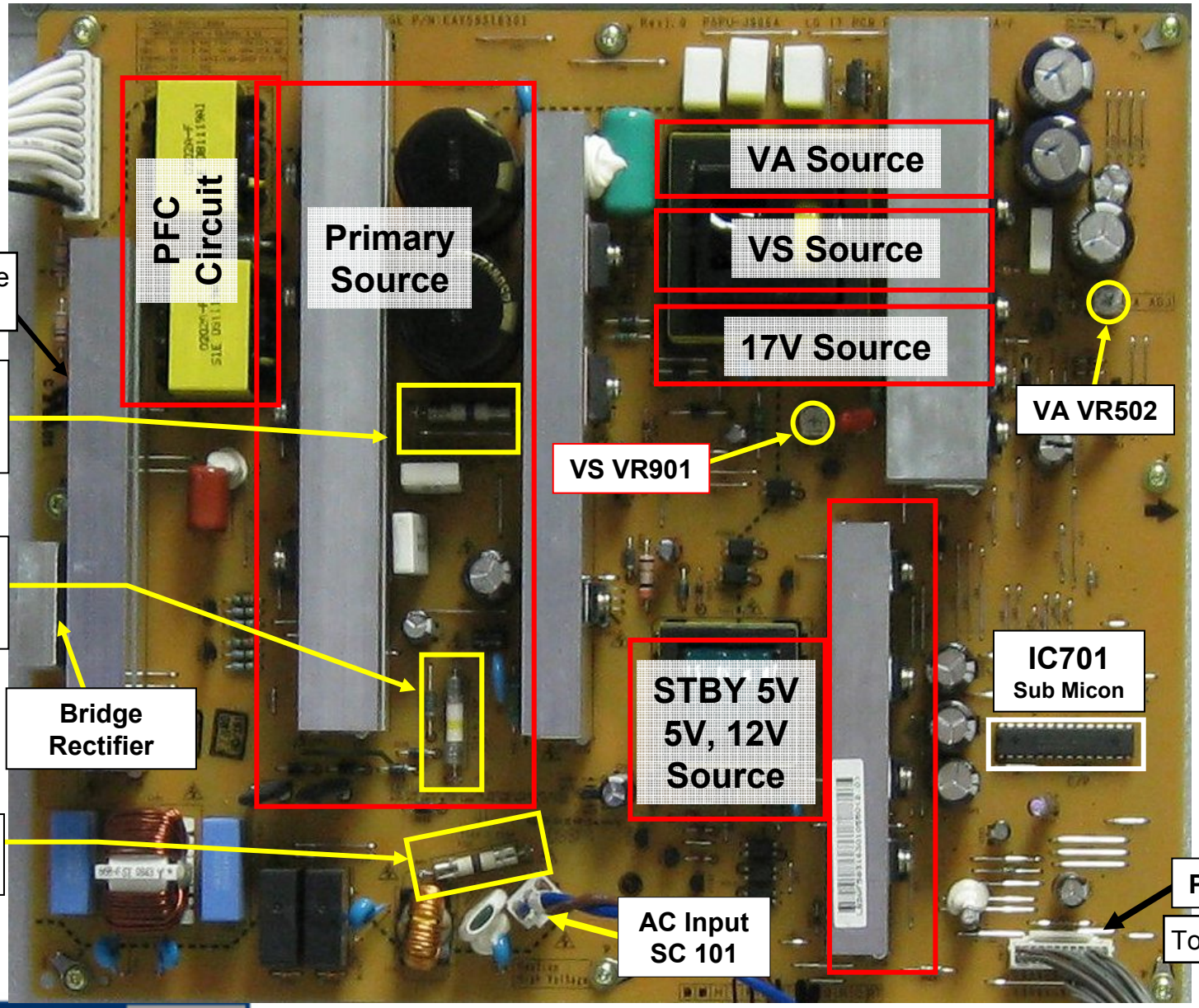
Switch Mode Power Supply Overview

The Switch Mode Power Supply Board Outputs to the :

Y-SUS Board	**VS**	**Drives the Display Panel's Horizontal Electrodes**
	VA	**Primarily responsible for Display Panel Vertical Electrodes**
	M5V	**Used to develop Bias Voltages on the Y-SUS, X Drive, and Control Boards**
Main Board	**STBY 5V**	**Microprocessor Circuits**
	17V	**Audio B+ Supply**
	12V	**Tuner B+ Circuits**
	5V	**Signal Processing Circuits**

Adjustments	**There are 2 adjustments located on the Power Supply Board VA and VS. The 5V VCC is pre-adjusted and fixed. All adjustments are made with relation to Chassis Ground. Use "Full White Raster" 100 IRE**	
	VA	**RV502**
	VS	**RV901**

Power Supply Circuit Layout



Power Supply Basic Operation

AC Voltage is supplied to the SMPS Board at Connector SC101 from the AC Input assembly. Standby 5V is developed from 160V source supply (which during run measures 380V measured from the primary fuse F302).
This supply is also used to generate all other voltages on the SMPS.

The STBY5V (standby) is B+ for the Controller (IC701) on the SMPS and output at P813 pins 11 and 23 then sent to the Main board for Microprocessor (IC1) operation. AC Detect is generated on the SMPS, by rectifying a small sample of the A/C Line at D102 and associated circuitry and routed to the Controller (IC701) where it outputs at pin 15 and sent to P813 pin 18 to the Main Board where it is sensed and monitored by the Main Microprocessor (IC1). The AC Det in this set works differently than most. If AC Det is missing the Microprocessor will turn off the television in about 10 seconds after turn on. This will happen each time turn on is attempted.
A new feature included on the side keypad is called a Main Power Switch which opens a ground allowing the “Key On” line of P813 Pin 24 to go high, turning off the 5V STB line defeating the Micro Processor (IC1) on the Main Board and Remote Control Operation.

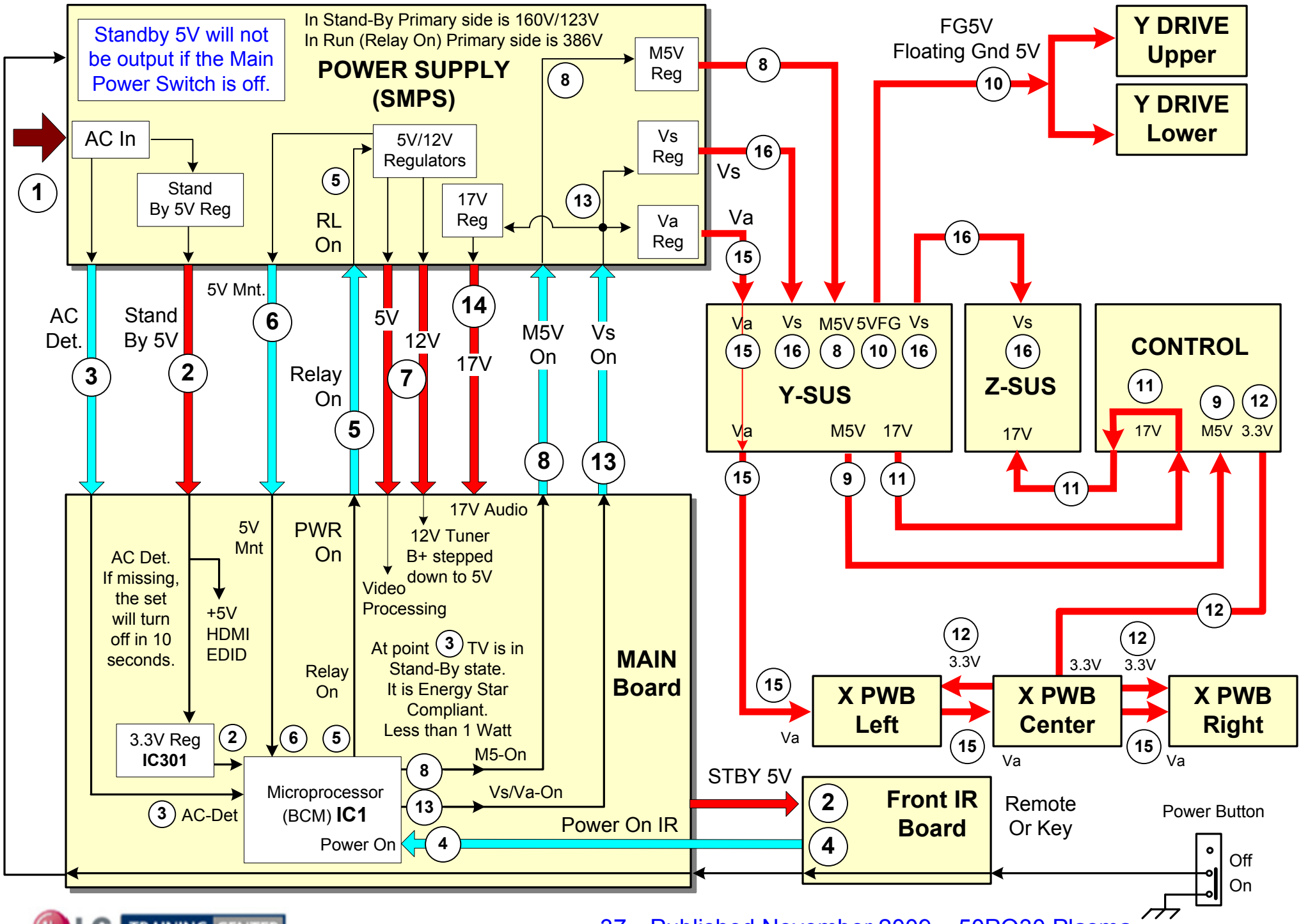
When the Microprocessor (IC1) on the Main Board receives an “ON“ Command from either the Power button or the Remote IR Signal, it outputs a high called RL ON at Pin 19 of P813. This command causes the RelaY-Drive Circuit to close both Relays RL102 and RL103 bringing the PFC source up to full power by increasing the 160V standby to 380V run which can be read measuring voltage at Fuse F302 and F801 from “Hot” Ground. At this time the run voltages 12V, and +5V sources become active and are sent to the Main Board via P813 (12V at pins 5 and 6 and 5V at pins 9,10, and 12). The 5V detect line from the SMPS Board to the Main Board can be measured at pin 17 of P813. It is not used.

The next step is for the Microprocessor (IC1) on the Main Board to output a high on M5V ON Line to the SMPS at P813 Pin 21 which is sensed by the Controller (IC701) turning on the M5V line and output at P811 pins 9 and 10 to the Y-SUS board P201 pins 9, 10. Then it is routed to the Control and Z-SUS boards.

Full Power occurs when the Microprocessor (IC1) on the Main Board brings the VS-ON line high at Pin 20 of P813 of the SMPS Board. VS-ON is routed to the Controller (IC701) which turns on the 17V Audio, VA, and the VS supplies. VA and VS output at P811 to the Y-SUS board. (VA pins 6 and 7 and VS pins 1 and 2). The 17V Audio supply outputs to the Main board at P814 pins 1 and 2 and used for Audio processing and amplification.

AUTO GND Pin 22 of P813: This pin is grounded on the Main board. When it is grounded, the Controller IC701 works in the normal mode, meaning it turns on the power supply via commands sent from the Main board. When this pin is floated (opened), it pulls up and turns the Controller IC701 on in the Auto mode. In this state, the Controller turns on the power supply in stages automatically. A load is necessary to perform a good test of the SMPS if the Main board is suspect.

50PQ30 POWER SUPPLY START UP SEQUENCE



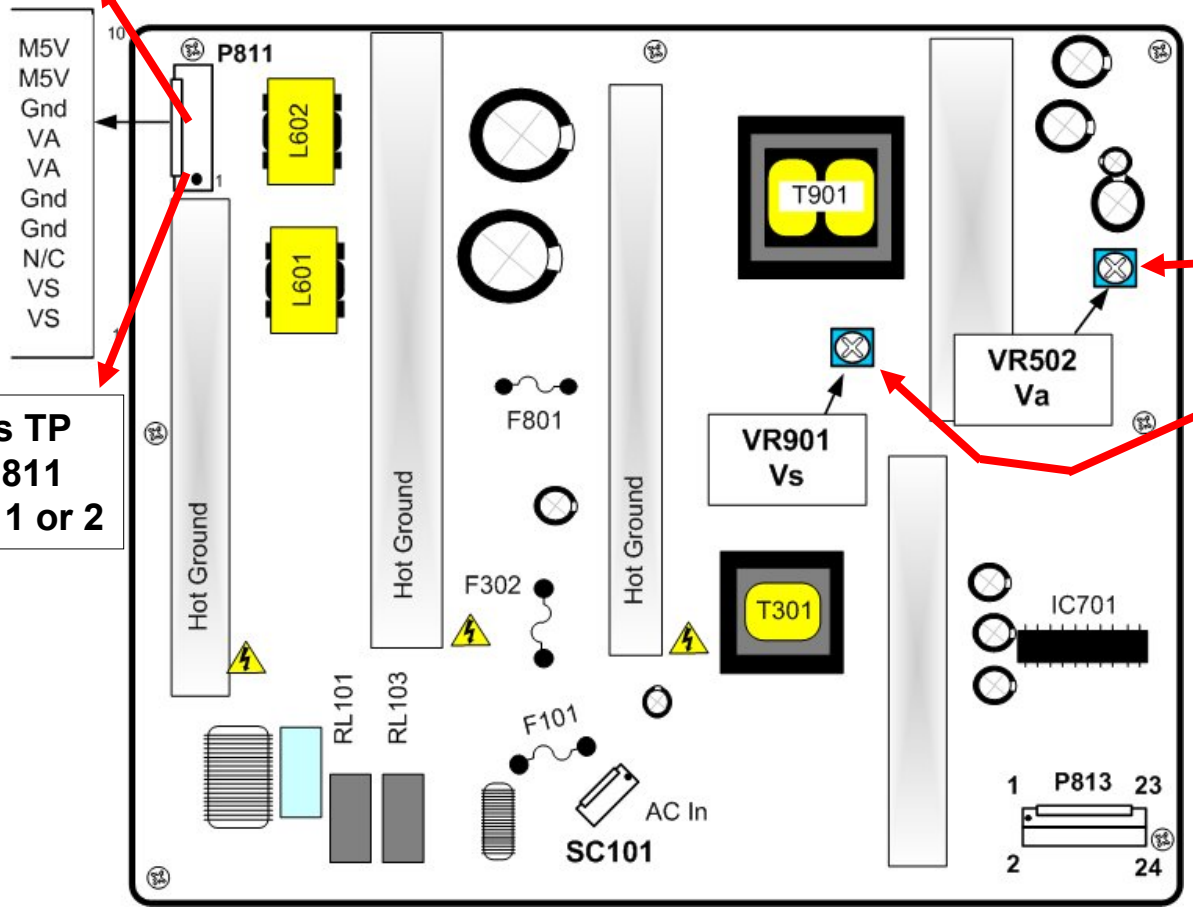
Power Supply Va and Vs Adjustments

Important: Use the Panel Label
Not this book for all voltage adjustments.

Use Full White Raster "White Wash"

Va TP
P811
Pin 6 or 7

Vs TP
P811
Pin 1 or 2

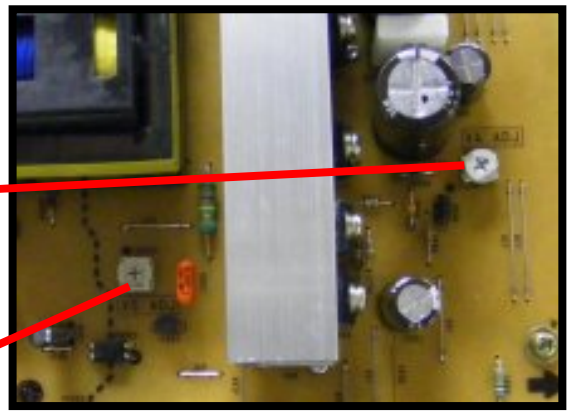


Example Voltage Label

Model : PDP 42G2####
Voltage Setting:5V / Va:60V / Vs:194V
N.A. / -175 / 140 / N.A. / 80
Max Watt : 330 W (Full White)

VA Adjust VR502

VS Adjust VR901

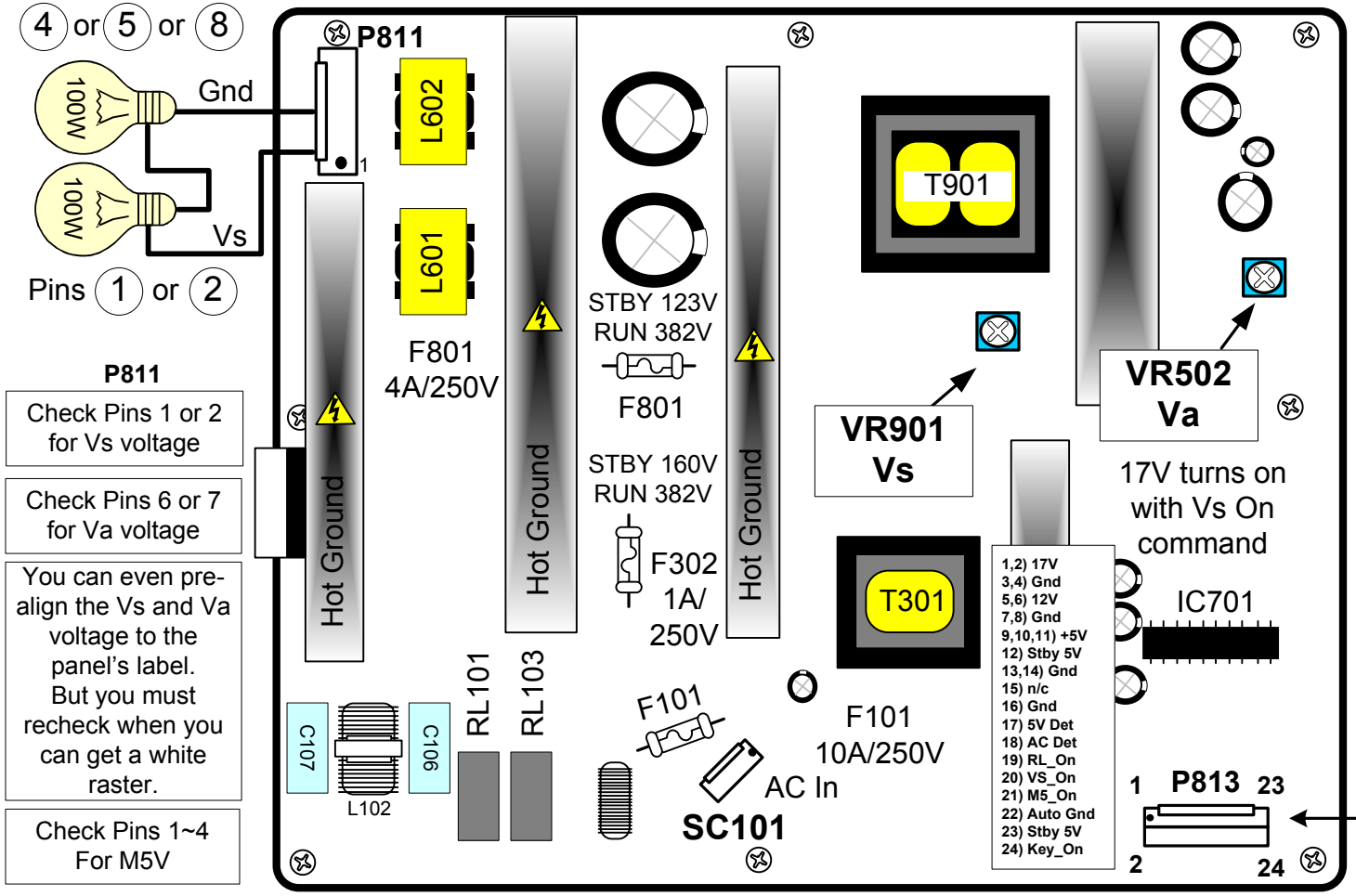


Vs Adjust:
Place voltmeter on pin 1 or 2 of P811. Adjust VR901 until the reading matches your label.

Va Adjust:
Place voltmeter on pin 6 or 7 of P811. Adjust VR502 until the reading matches your label.

50PQ30 SMPS STATIC TEST UNDER LOAD

Using two 100 Watt light bulbs, attach one end to Vs and the other end to ground. Apply AC to SC101. If the light bulbs turn on and VS is the correct voltage, allow the SMPS to run for several minutes to be sure it will operate under load. If this test is successful and all other voltages are generated, you can be fairly assured the power supply is OK.
Note: To be 100% sure, you would need to read the current handling capabilities of each power supply listed on the silk screen on the SMPS and place each supply voltage under the appropriate load.



P811

Check Pins 1 or 2 for Vs voltage
Check Pins 6 or 7 for Va voltage
You can even pre-align the Vs and Va voltage to the panel's label. But you must recheck when you can get a white raster.
Check Pins 1~4 For M5V

Provided the Power Button is closed, any time AC is applied to the SMPS, STBY 5V and AC DET should be present.

If AC Det is missing, the TV will come on then shut off within 10 Sec.
This will happen each time the TV is turned on.

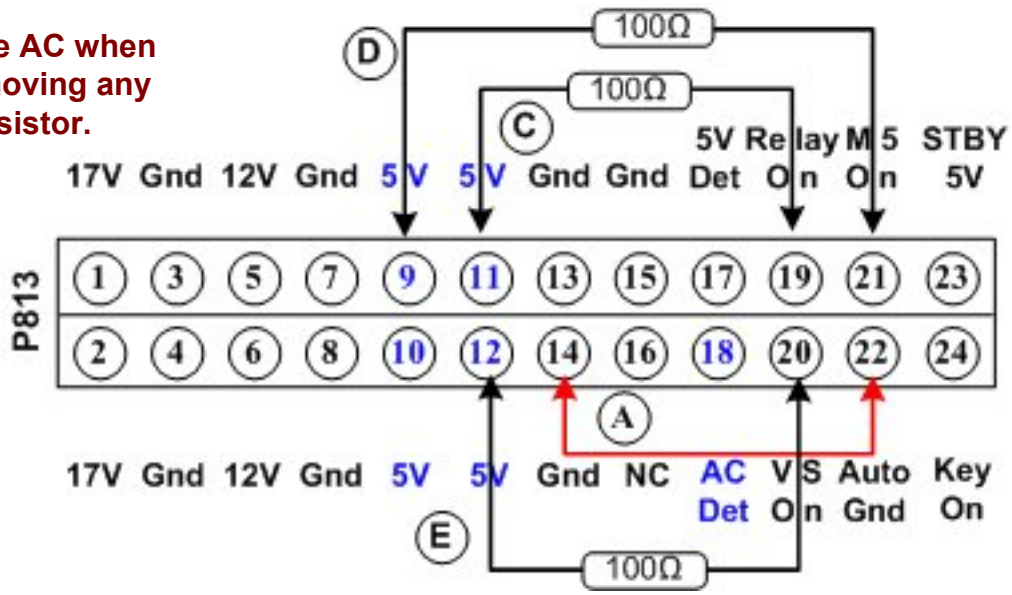
P813

Check Pins 11 or 23 for 5V SBY
Check Pin 18 for AC Det (5V)
Check Pin 9,10,12 for (+5V)
Check Pins 1 or 2 for 17V
Check Pins 5 or 6 for 12V

Note: This SMPS will run without a load, however if the Vs is not loaded, the 17V may pulsate up and down.
It is always best to test the SMPS under a load using the 2 light bulbs.

Power Supply Static Test (Forcing on the SMPS in stages)

WARNING: Remove AC when adding or removing any plug or resistor.



P811 disconnected from the Y-SUS or the SMPS.

P1006 disconnected from the Main board.

Use the holes in the connector P1006 side to insert the resistor or jumper leads.

(A) Ground the Auto Ground (Pin 22) on P813.

(B) When AC Power is applied, Check AC_Det (Pin 18) and 5V Stand-By (Pins 12 and 23) are 5V.

(C) 100Ω ¼ watt resistor added from STBY 5V (Pins 12 or 23) *(Note pins 9~11 are not on yet).* to RL_ON (Pin 19) closes relay RL101 and RL103 turning on the 5V and 12V Supplies.

(D) 100Ω ¼ watt resistor added from 5V (Pins 9 ~ 11) to M5 ON (Pin 21) brings the M5V (P811 pins 9, 10) line high.

(E) 100Ω ¼ watt resistor added from STBY 5V (Pins 9 ~ 11) to VS ON (Pin 20) brings the

- **17V (P813 pins 1 and 2) lines high.**
- **VA and VS (P811 pins 1 and 2 Vs and Pins 6 and 7 Va) lines high.**

Connector P813 Identification, Voltages and Diode Check

P813 CONNECTOR "SMPS" to "Main" P1006

Pin	Label	STBY	Run	Diode Mode
1	[a]17V	0V	17.3V	2.2V
3	Gnd	Gnd	Gnd	Gnd
5	[b]12V	0V	12V	Open
7	Gnd	Gnd	Gnd	Gnd
9	[b]5V	5V	5V	1.1V
11	[b]5V	5V	5V	1.1V
13	Gnd	Gnd	Gnd	Gnd
15	Gnd	Gnd	Gnd	Gnd
17	5V Det	.15V	5V	Open
19	RL On	0V	3.73V	Open
21	M5 ON	0V	3.24V	Open
23	Stby 5V	5V	5V	Open

Pin	Label	STBY	Run	Diode Mode
2	[a]17V	0V	17.3V	2.2V
4	Gnd	Gnd	Gnd	Gnd
6	[b]12V	0V	12V	Open
8	Gnd	Gnd	Gnd	Gnd
10	[b]5V	5V	5V	1.1V
12	Stby 5V	5V	5V	1.13V
14	Gnd	Gnd	Gnd	Gnd
16	Gnd	Gnd	Gnd	Not Used
18	AC Det	5V	5V	Open
20	VS On	0V	3.2V	Open
22	Auto Gnd	Gnd	Gnd	Open
24	[c]Key On	0V	0V	Open

[a]Note: *The 17V turns on when the VS On command arrives.*

[b]Note: *The 5V/12V turns on when the RL On command arrives.*

[c]Note: *If the Key On line is 4.39V, the Main Power Switch is open. Stand-By 5V will shut off.*

Diode Mode Readings taken with all connectors Disconnected. DVM in Diode Mode.

Connector SC101 and P811 Identification, Voltages and Diode Check

SC101 AC INPUT

Connector	Pin Number	Standby	Run	Diode Mode
SC101	1 and 3	120VAC	120VAC	Open

P811 CONNECTOR "Power Supply“ to Y-SUS “P201”

Pin	Label	STBY	Run	Diode Mode
1, 2	Vs	0V	*194V	Open
3	n/c	n/c	n/c	n/c
4, 5	Gnd	0V	0V	Gnd
6, 7	Va	0V	*60V	Open
8	Gnd	0V	0V	Gnd
9, 10	M5V	0V	5V	0.86V

*** Note: This voltage will vary in accordance with Panel Label**

Diode Mode Readings taken with all connectors Disconnected. DVM in Diode Mode.

Y-SUS BOARD SECTION (Overview)

Y-SUS Board develops the V-Scan drive signal to the Y-Drive boards.

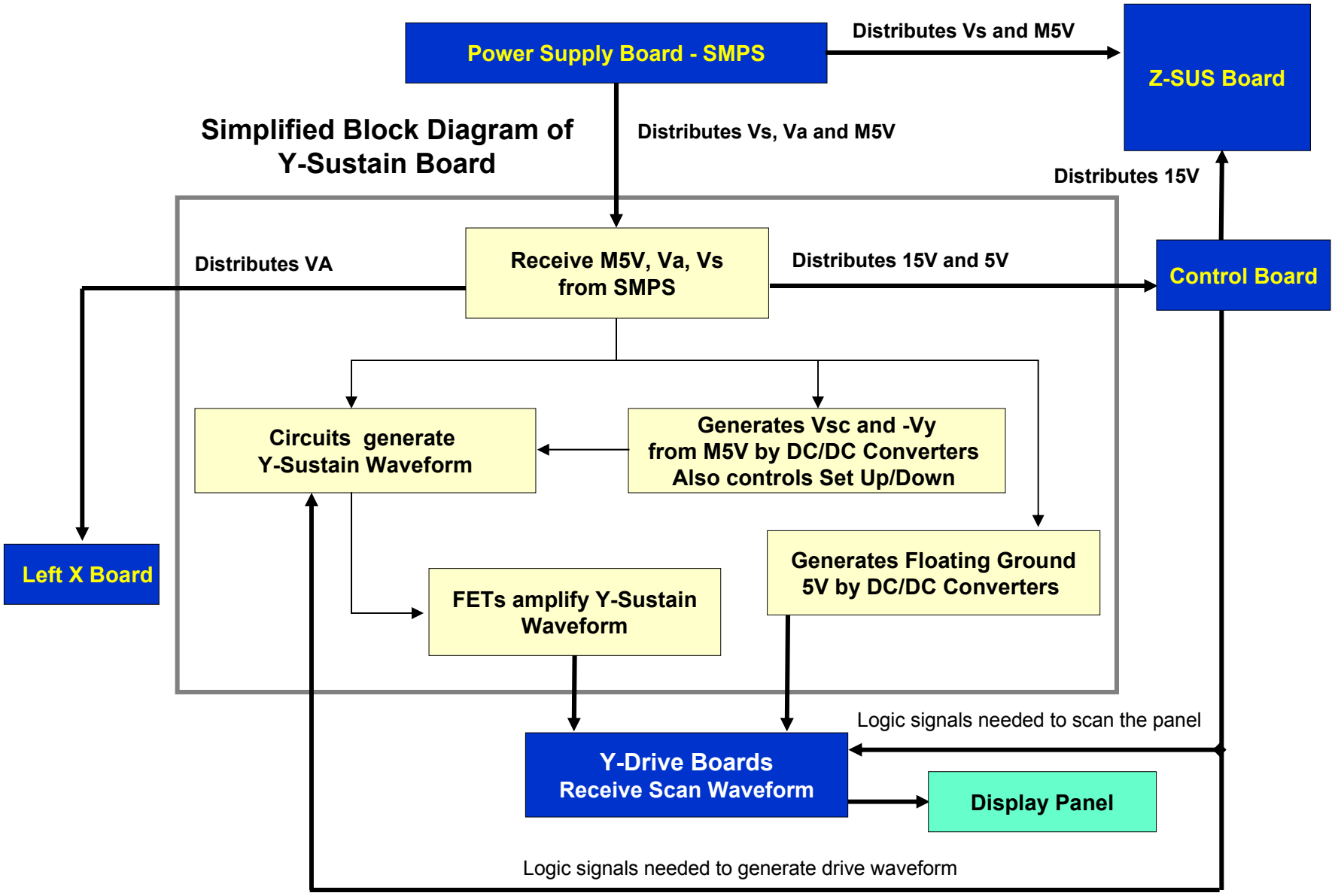
This Section of the Presentation will cover troubleshooting the Y-SUS Board for the Single Scan Plasma. Upon completion of the Section the technician will have a better understanding of the operation of the circuit and will be able to locate voltage and Diode mode test points needed for troubleshooting and alignments.

- Adjustments
- DC Voltage and Waveform Checks
- Diode Mode Measurements

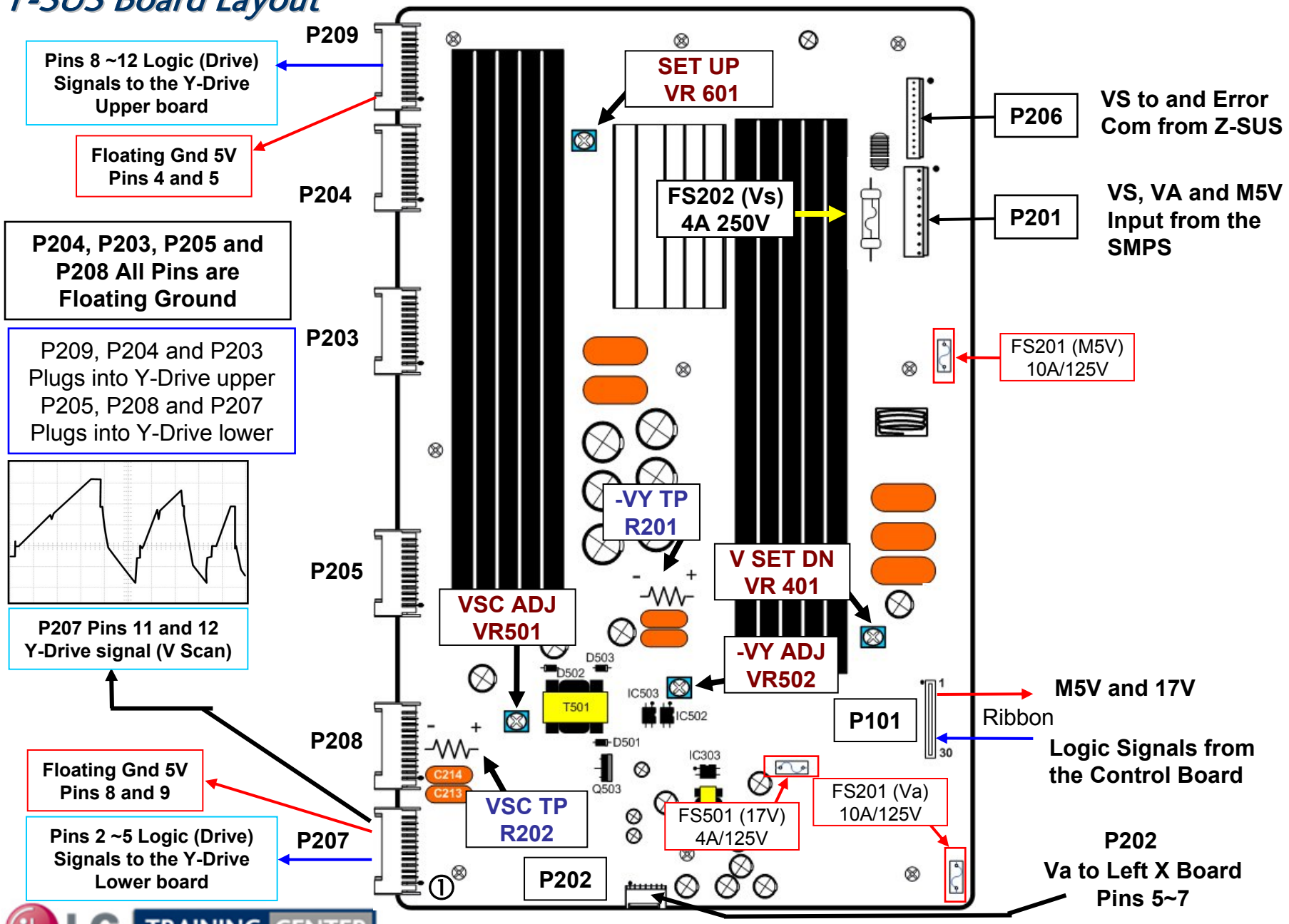
Operating Voltages

SMPS Supplied	VA	VA supplies the Panel Vertical Electrodes (Routed to the Left X-Board)
	VS	VS Supplies the Panel Horizontal Electrodes (Also routed to the Z-SUS board)
	M5V	5V Supplies Bias to Y-SUS (Then Routed to the Control board and Z-SUS board)
Y-SUS Developed	-VY VR502	-VY Sets the Negative excursion of the Y-SUS Drive Waveform
	VSC VR501	VSC Set the amplitude of the complex waveform.
	V SET UP VR601	SET UP sets amplitude of the Top Ramp of the Drive Waveform
	V SET DN VR602	SET DOWN sets the Pitch of the Bottom Ramp of the Drive Waveform
	15V	To the Control Board then routed to the Z-SUS board
Floating Ground	FG 5V	Used on the Y-Drive boards (Measured from Floating Gnd)
	FG 15V	Used in the Development of the V-Scan signal (Measured from Floating Gnd)

Y-SUS Block Diagram



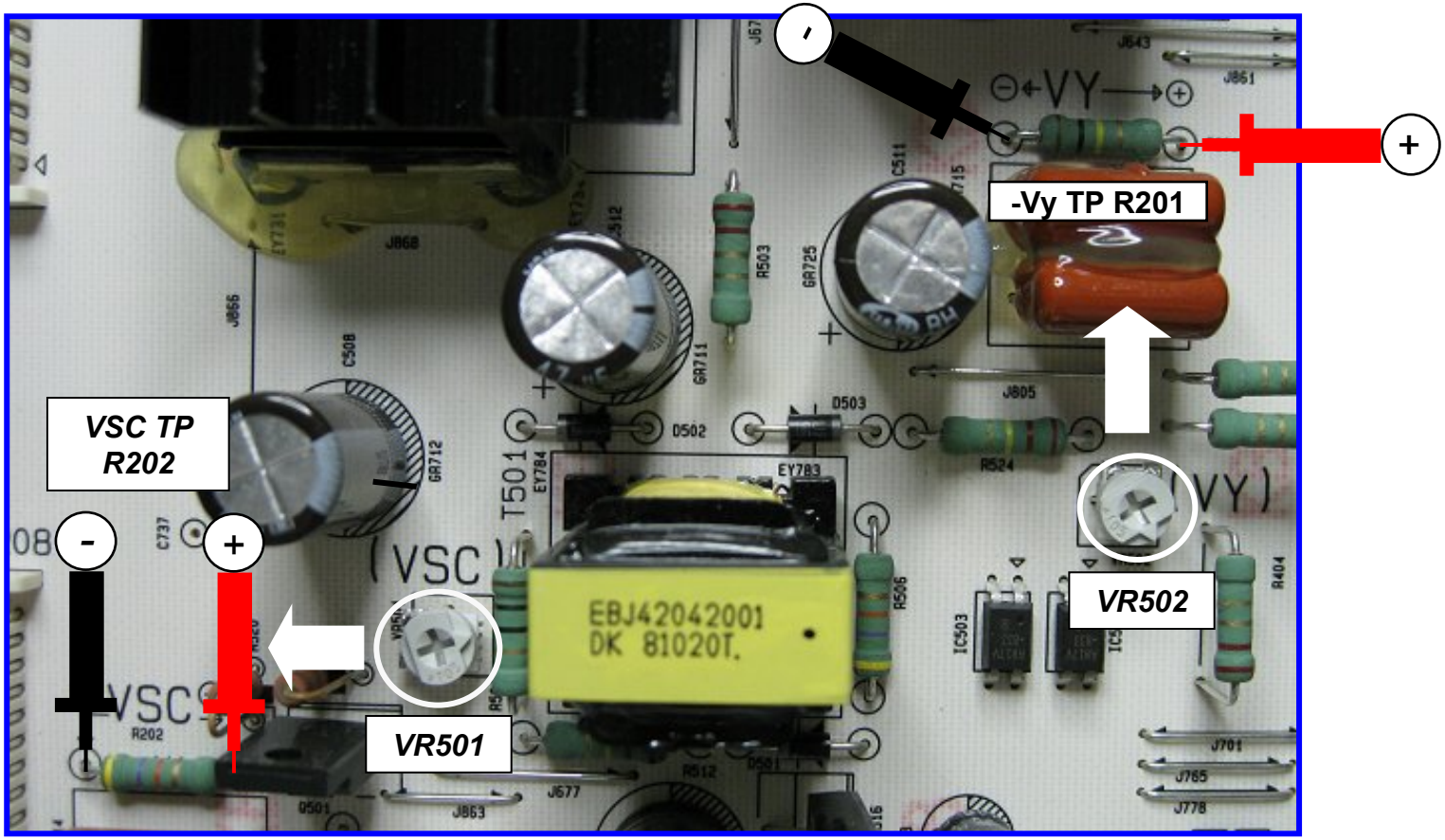
Y-SUS Board Layout



VSC and -VY Adjustments

These are DC level Voltage Adjustments

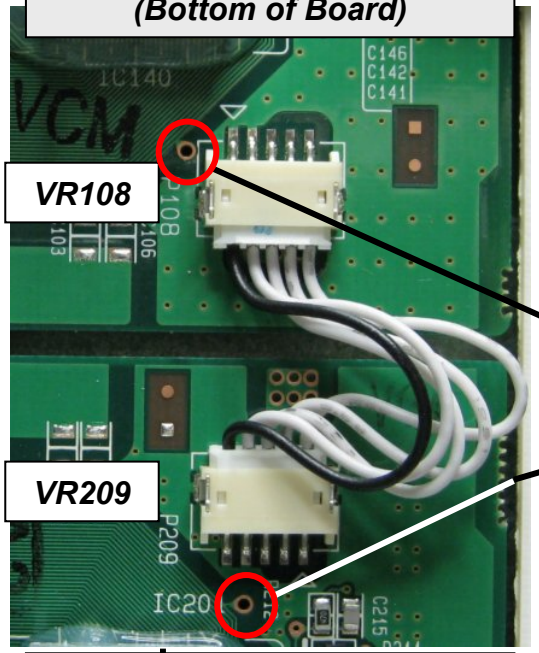
Voltage Reads Positive



Set should run for 15 minutes, this is the "Heat Run" mode.
Set screen to "White Wash".
Adjust –Vy to Panel Label voltage (+/- 1V)
Adjust VSC to Panel Label voltage (+/- 1V)

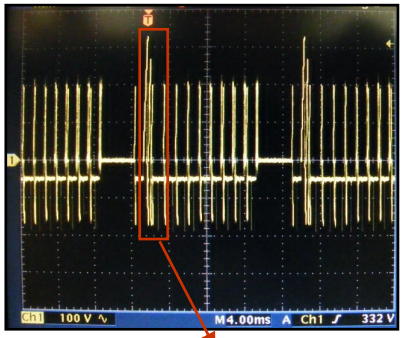
Lower Center of board Just below Heat Sinks

Y-Drive Upper Test Point (Bottom of Board)



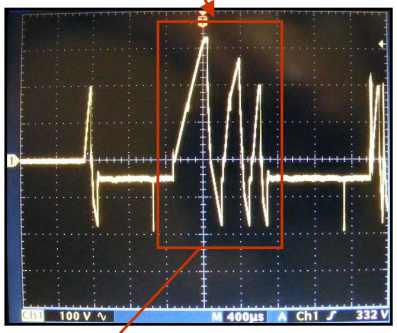
Y-Drive Lower Test Point (Top of Board)

① Overall signal observed 4mS/div

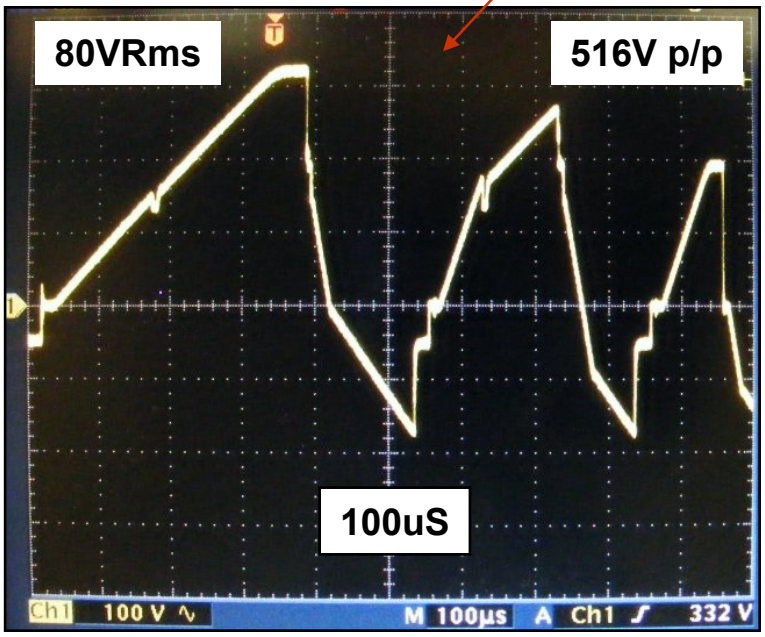


There are several other test points on either the Upper or Lower Y-Drive boards that can be used. Basically any output pin on any of the FPC to the panel are OK to use.

② Highlighted signal from waveform above observed 400uS/div



③ Highlighted signal from waveforms above observed 100uS/div



NOTE: The Waveform Test Points are fragile. If by accident the land is torn and the run lifted, make sure there are no lines left to right in the screen picture.

Observing (Capturing) the Y-Drive Signal for Set Up Adjustment

Set must be in "WHITE WASH"
All other DC Voltage adjustments should have already been made.

Fig 1:
As an example of how to lock in to the Y-Drive Waveform.
Fig 1 shows the signal locked in at 4ms per/div.
Note the 2 blanking sections.
The signal for **SET-UP** is outlined within the Waveform

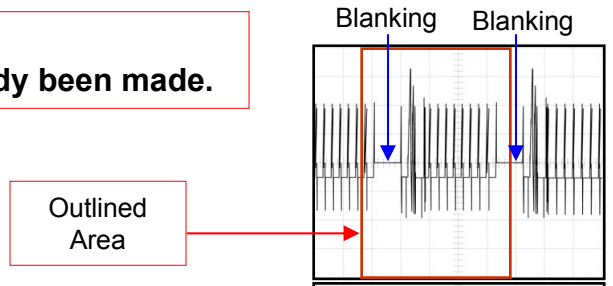


FIG1
4mS

Fig 2:
At 2mSec per/division, the waveform to use for **SET-UP** Is now becoming clear.
Now, the two blanking signal are still present.

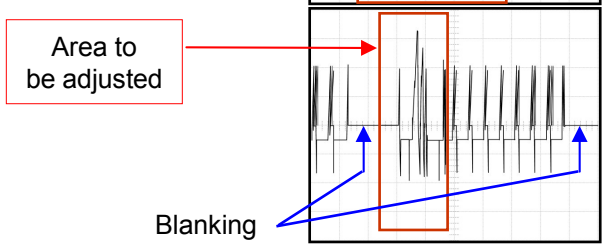


FIG2
2mS

Fig 3:
At 400us per/div. the signal for **SET-UP** is now easier to recognize. It is outlined within the Waveform.
Remember, this is the first large signal to the right of blanking.

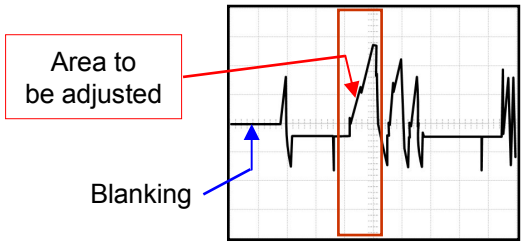


FIG3
400uS

Fig 4:
At 40uSec per/division, the adjustment for **SET-UP** can be made.
It will make this adjustment easier if you use the "Expanded" mode of your scope.

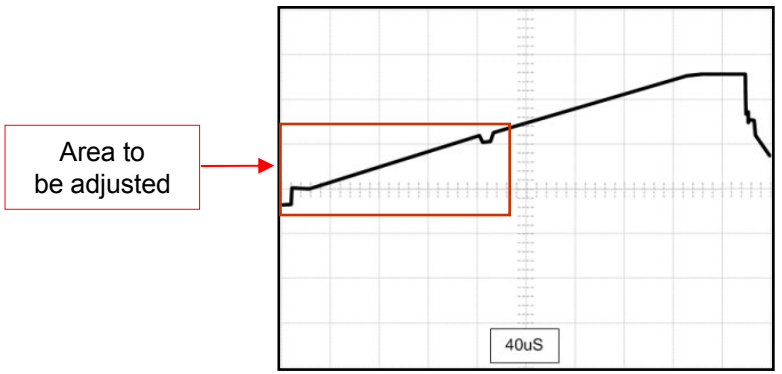


FIG4
40uS

Observing (Capturing) the Y-Drive Signal for Set Up Adjustment

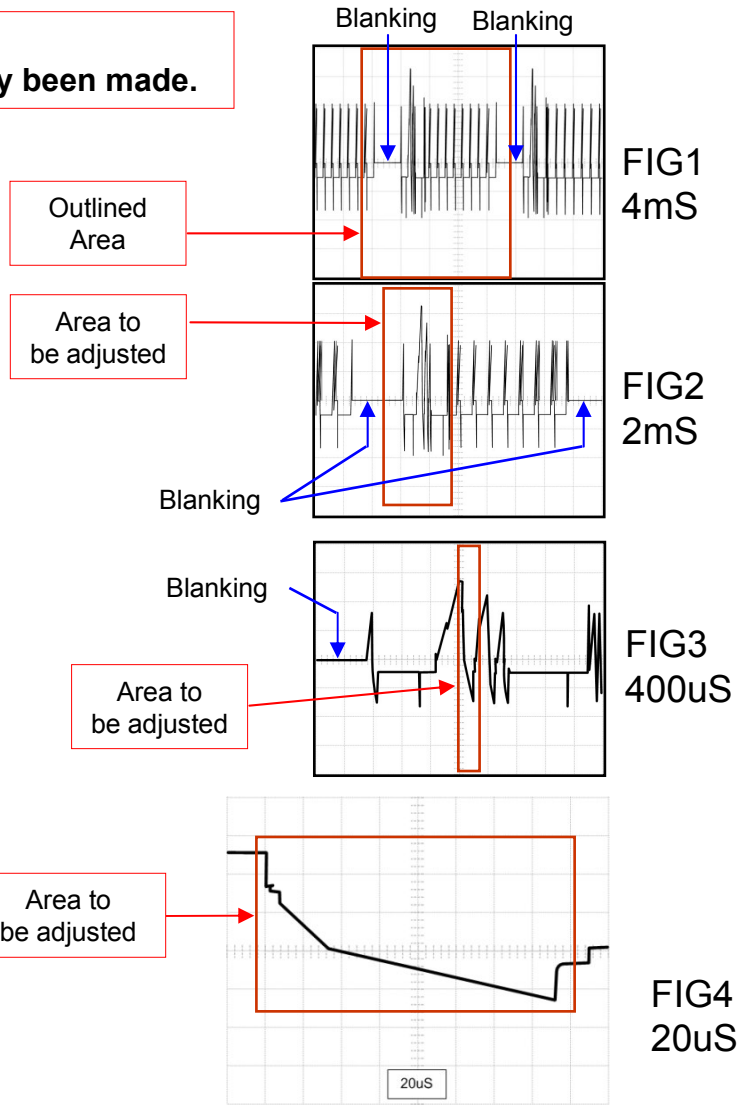
Set must be in "WHITE WASH"
All other DC Voltage adjustments should have already been made.

Fig 1:
As an example of how to lock in to the Y-Drive Waveform.
Fig 1 shows the signal locked in at 4ms per/div.
Note the 2 blanking sections.
The signal for **SET-DN** is outlined within the Waveform

Fig 2:
At 2mSec per/division, the waveform to use for **SET-DN** is now becoming clear.
Now the two blanking signals are still present.

Fig 3:
At 400us per/div. the signal for **SET-DN** is now easier to recognize. It is outlined within the Waveform.
Remember, this is the first large signal to the right of blanking.

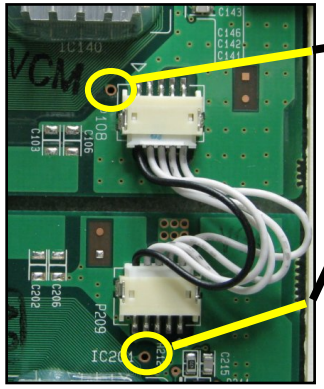
Fig 4:
At 20uSec per/division, the adjustment for **SET-DN** can be made.
It will make this adjustment easier if you use the "Expanded" mode of your scope.



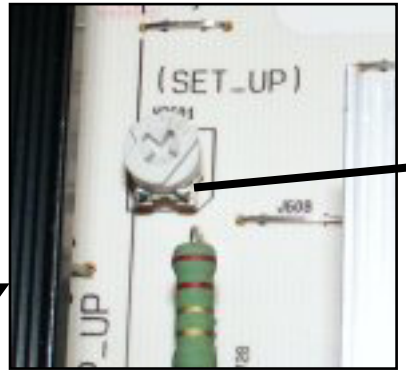
Set Up and Set Down Adjustments

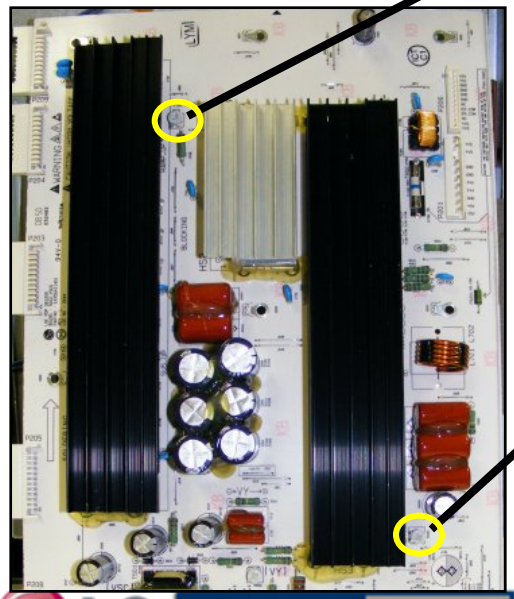
Set must be in "WHITE WASH"
All other DC Voltage adjustments should have already been made.

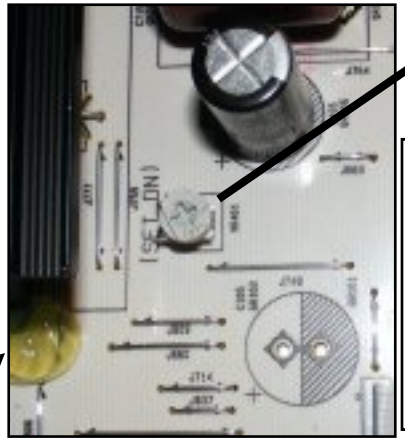
Observe the Picture while making these adjustments. Normally, they do not have to be done.



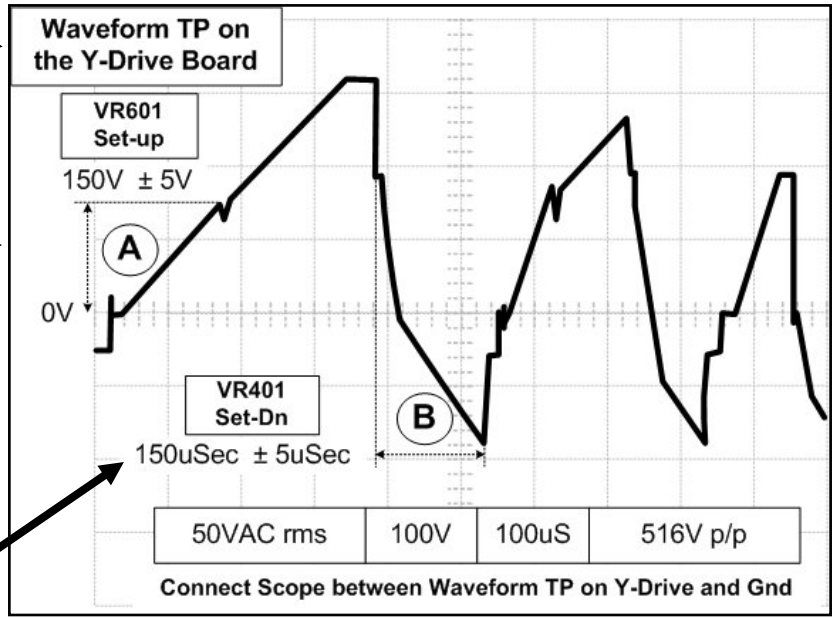
Y-Drive Test Point







ADJUSTMENT LOCATIONS:
Top Left and Center Right

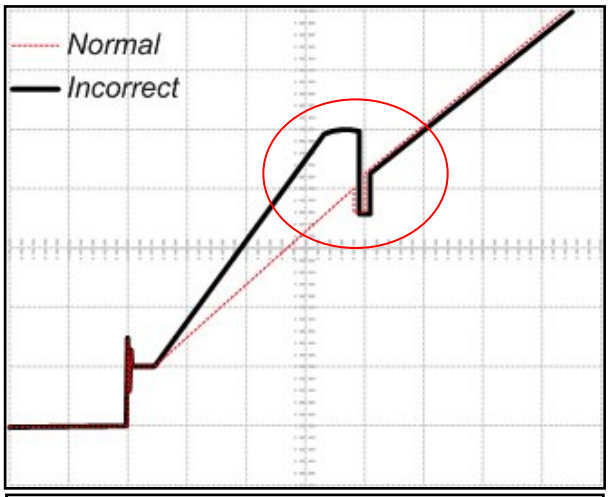


SET-UP ADJUST:
1) Adjust **VR601** and set the **(A)** portion of the signal to match the waveform above. (150V ± 5V)

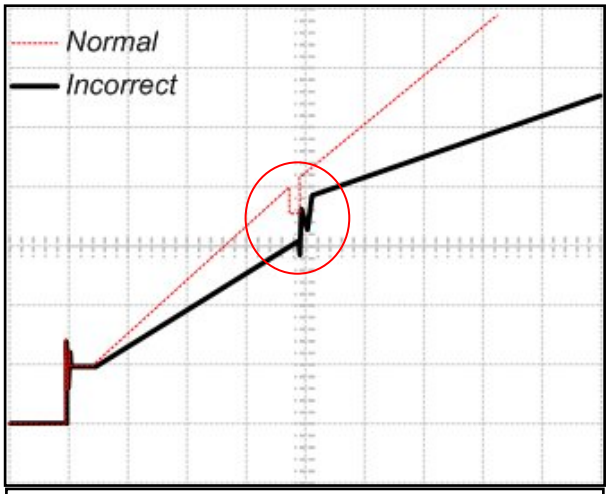
SET-DN ADJUST:
2) Adjust **VR401** and set the **(B)** time of the signal to match the waveform above. (100uSec 5uSec)

Set Up Adjustment Too High or Low

Set Up swing is Minimum 80V Max 200V

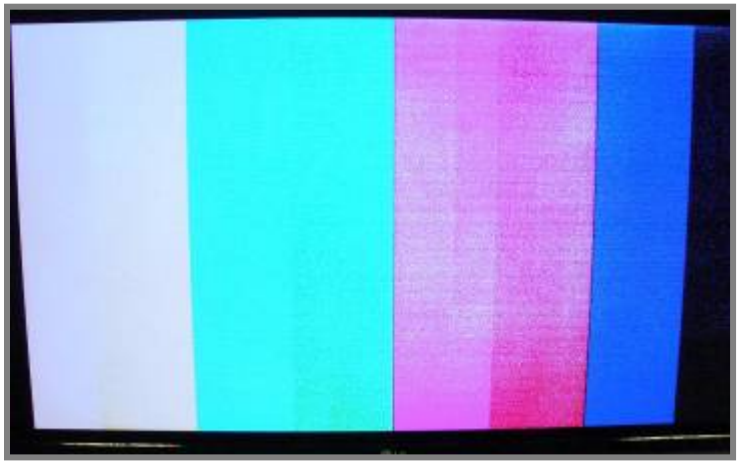


Ramp (SET UP) Too High (200V)
Full Counter Clock Wise

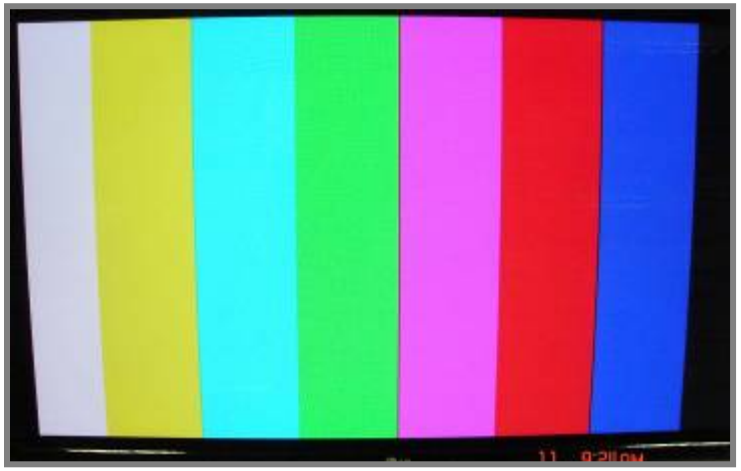


Ramp (SET UP) Too Low (80V)
Full Clock Wise

Panel Waveform Adjustment



The center begins to wash out and arc due to **SET UP**

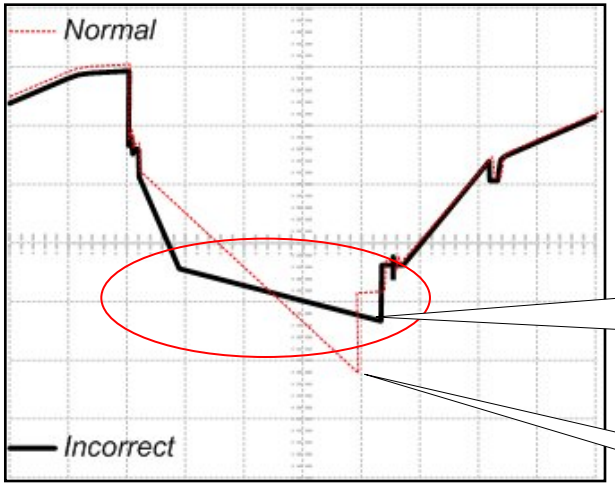


Very little alteration to the picture, the wave form indicates a distorted **SET UP**. The peek widens due to the **SET UP** peeking too quickly.

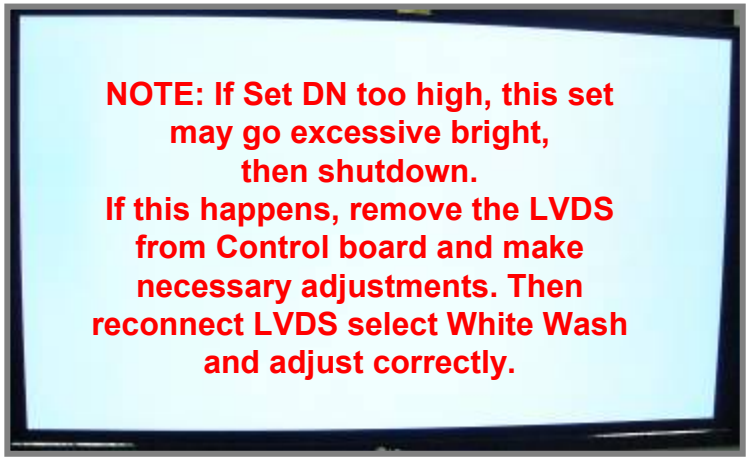
Panel Waveform Adjustment

Set Down Adjustment Too High or Low

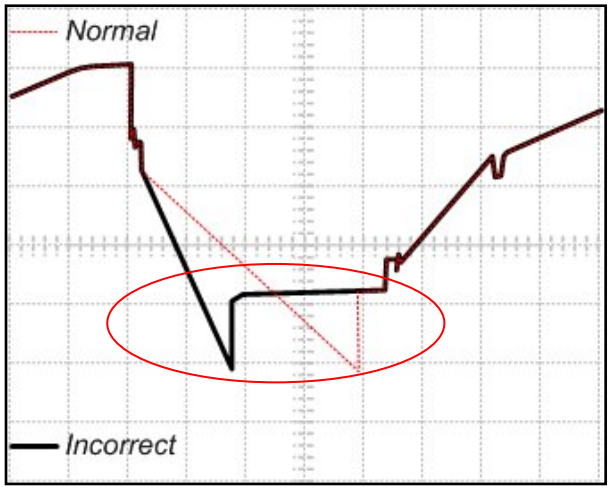
Set Dn swing is Minimum 73uS Max 166uS+



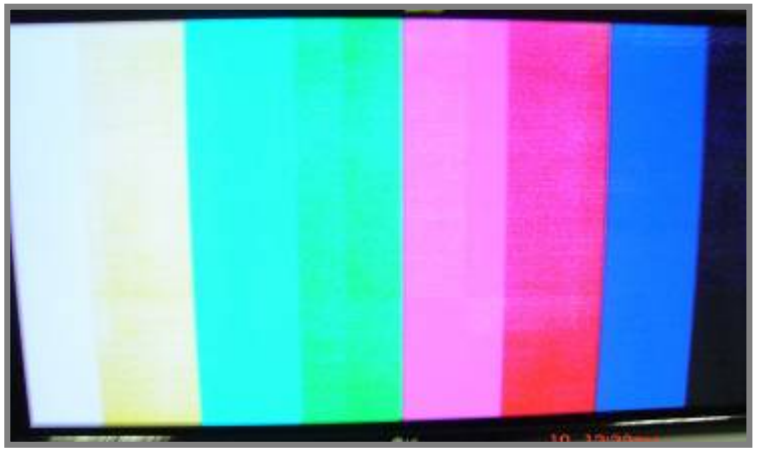
(SET DN) Too High 166uSec Full Clock Wise



All of the center washes out due to increased **SET_DN** time.



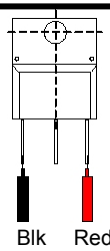
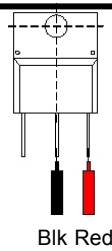
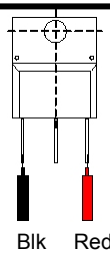
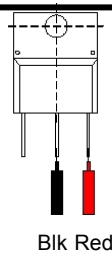
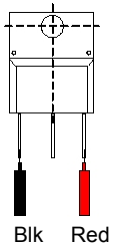
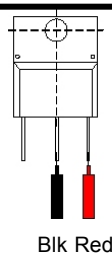
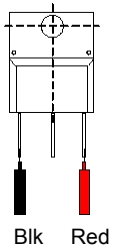
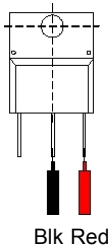
(SET DN) Too Low Counter Clock Wise



The center begins to wash out and arc due to decreased **SET DN** time.

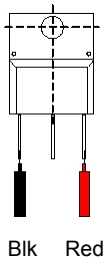
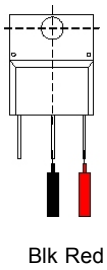
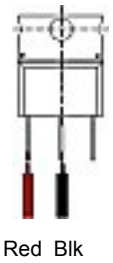
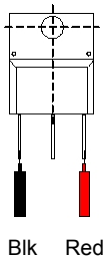
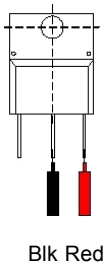
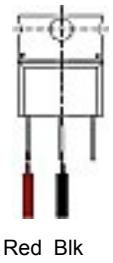
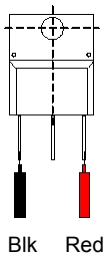
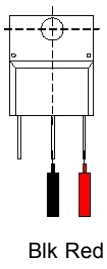
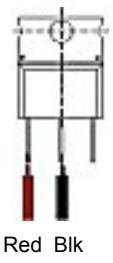
Y-SUS How to Check the Output FETs (1 of 2)

Name is printed on the components. Readings "In Circuit".

45F122 **Q34**	 Shown: 0.6V Reverse: 1.64V	 Shown: 0.38V Reverse: Open	 Shown: 2.02V Reverse: Open
RJP4584 **Q32**	 Shown: 0.69V Reverse: 0.67V	 Shown: 0.483V Reverse: Open	 Shown: 1.09V Reverse: Open
K3667 ***Q18** **Q31**	 Shown: 0.59V~0.6V Reverse: Open *Reversed: 2.18V	 Shown: 0.5V Reverse: Open	 Shown: Open *Shown: 2.2V Reverse: Open
RF2001 **D31** **D32** **D33** **D34** **D36** **D717**	 Shown: Shorted Reverse: Shorted 0.3 Ohms	 Shown: 0.37V~0.38V Reverse: Open	 Shown: 0.37~0.38V Reverse: Open

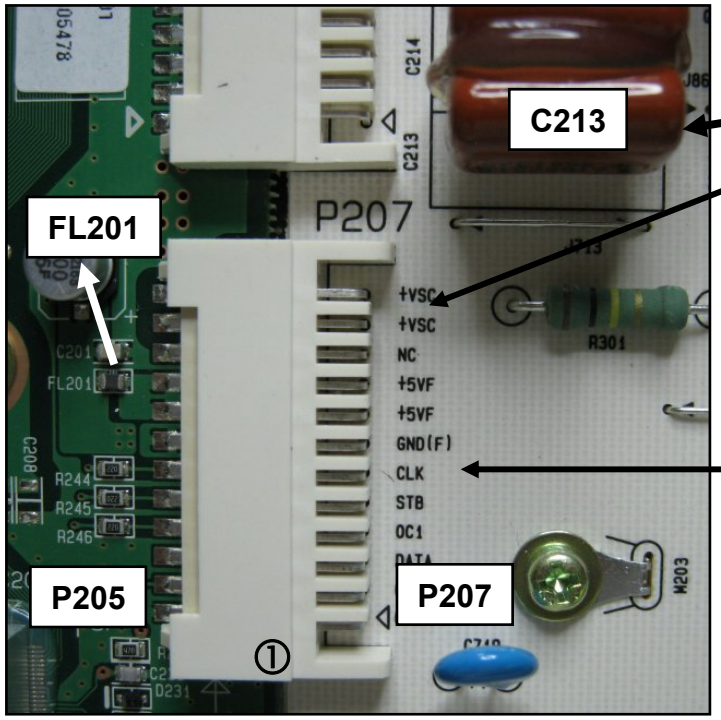
Y-SUS How to Check the Output FETs (2 of 2)

Name is printed on the components. Readings "In Circuit".

I4F14229 **Q16** **Q17**	 Blk Red Shown: 0.876V Reverse: 1.56V	 Blk Red Shown: 0.46V Reverse: Open	 Red Blk Shown: 1.95V Reverse: Open
30J124 **Q11** **Q12** **Q13**	 Blk Red Shown: 0.668V Reverse: 0.6V	 Blk Red Shown: 0.392V Reverse: Open	 Red Blk Shown: 0.998V Reverse: Open
RF020 **D11**	 Blk Red Shown: Shorted Reverse: Shorted (0.3 Ohm)	 Blk Red Shown: 0.392V Reverse: Open	 Red Blk Shown: 0.392V Reverse: Open

Y-SUS Board P207 (Bottom Connector) Explained

TIP: Use P207 pins 1 or 2 or the Right Side of C213 to test for Y Scan signal if the Y-Drive boards are removed

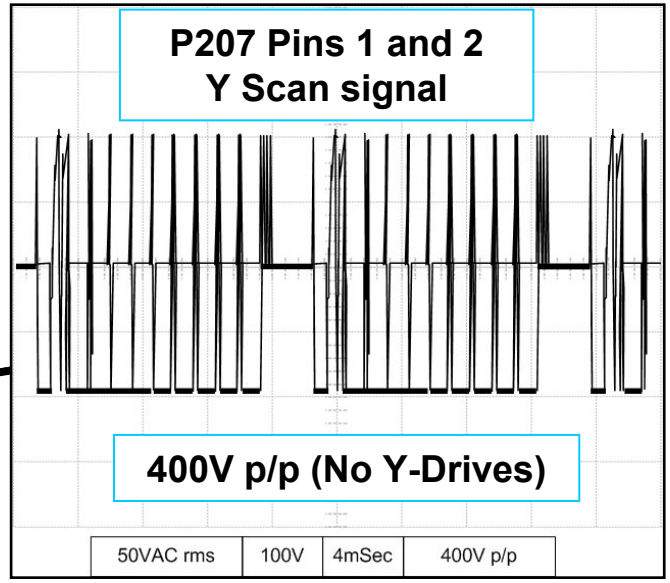


Y-Drive Lower Board

Y-SUS Board

Bottom Connector P207

P207 Pins 1 and 2 Y Scan signal



400V p/p (No Y-Drives)

440V p/p (With Y-Drives)

11) V Scan
10) V Scan
9) n/c
8) 5V VF
7) 5V VF
6) Ground (F)
5) STB
4) OC1
3) DATA
2) OC2
1) Ground (F)

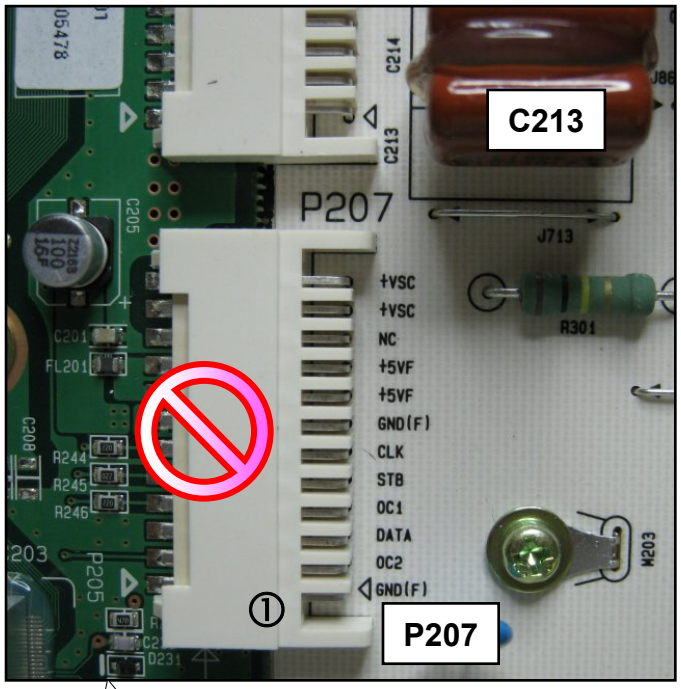
FG5V measured from Pins 7 or 8 Floating Gnd Pins 1 or 6

P207 Pins 2, 3, 4, and 5 are Logic (Drive) Signals to the Y-Drive lower. P209 carries the Y-Drive signals to the upper via P108.

Y-SUS P207 (Drive Output Plug) Diode Mode Testing

P205 of the Y-Drive Lower Board

P207 of the Y-SUS Board

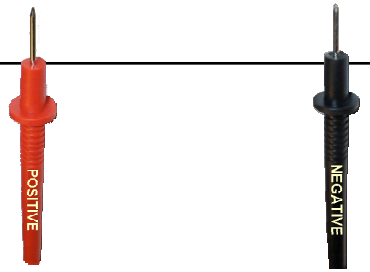


Y-Drive Board should be disconnected for this test.

Checking the Y-SUS Board P207
NOTE: Disconnected from the Y-DRIVE boards

Readings from Floating Ground (Pin 1)

		RED LEAD Blk Lead FG	BLACK LEAD Red Lead FG
Y-Drive Sig	12) V Scan	Open	Open
Y-Drive Sig	11) V Scan	Open	Open
	10) n/c	Open	Open
	9) 5V VF	1.9V	0.557V
	8) 5V VF	1.9V	0.557V
Floating Gnd	7) Ground (F)	0V	0V
	6) CLK	1.43V	0.66V
	5) STB	1.43V	0.66V
	4) OC1	1.43V	0.68V
	3) DATA	1.53V	0.66V
Floating Gnd	2) OC2	1.53V	0.68V
	1) Ground (F)	0V	0V

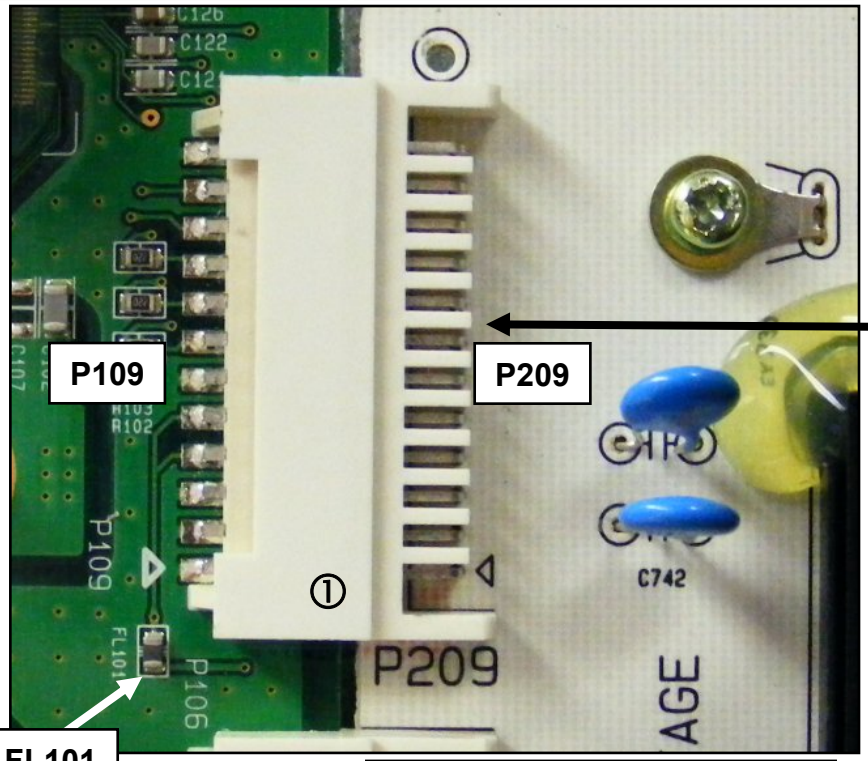


Meter in the Diode Mode

Y-SUS Board P209 (Top Connector) Explained

Y-Drive Upper Board

Y-SUS Board



Top Connector P209

P209 Pins 7, 8, 9, and 10 are Logic Signals from the Control board routed through the Y-SUS to the Y-Drive upper.

Between the Y-Drive upper and lower is P209, P108 which carries the Y-Drive (Scan) signals from the lower to the upper.

11) Ground (F)
10) DATA
9) OC1
8) STB
7) CLK
6) Ground (F)
5) 5V VF
4) 5V Vf
3) Ground (F)
2) Ground (F)
1) Ground (F)

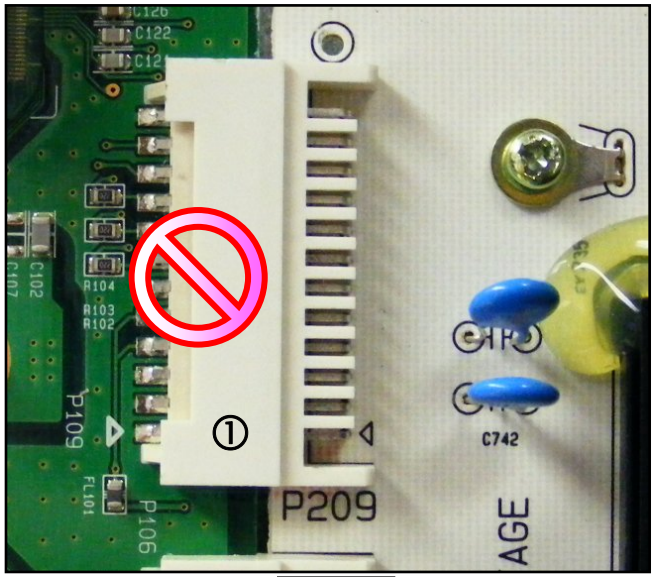
FG5V (+5V F) measured from Pins 4 or 5 to Floating Gnd
Pins 1~3, 6 or 11

Y-SUS P209 Diode Mode Testing

Checking the Y-SUS Board P209
NOTE: Disconnected from the Y-DRIVE boards

P109 of the Y-Drive Upper Board

P209 of the Y-SUS Board



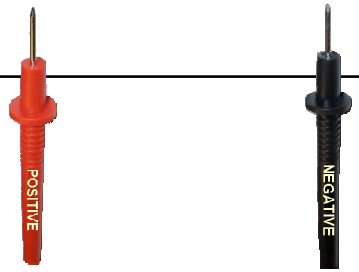
P209

Y-Drive Board should be disconnected for this test.

Readings from Floating Ground (Pin 1~3)

		RED LEAD Blk Lead FG	BLACK LEAD Red Lead FG
Floating Gnd	12) Ground (F)	0	0V
	11) DATA	1.53V	0.68V
	10) OC1	1.43V	0.66V
	9) STB	1.53V	0.68V
	8) CLK	1.43V	0.66V
	7) STB	1.43V	0.66V
Floating Gnd	6) Ground (F)	0V	0V
	5) 5V VF	1.94V	0.68V
Floating Gnd	4) 5V VF	1.94V	0.68V
Floating Gnd	3) Ground (F)	0V	0V
Floating Gnd	2) Ground (F)	0V	0V
	1) Ground (F)	0V	0V

Meter in the Diode Mode



Y-SUS P201 to SMPS P812 Plug Information

Voltage and Diode Mode Measurement

P201 CONNECTOR "Y-SUS" to "Power Supply" P811

Pin	Label	STBY	Run	Diode Mode
1	Vs	0V	*193V	Open
2	Vs	0V	*193V	Open
3	NC	NC	NC	NC
4	Gnd	Gnd	Gnd	Gnd
5	Gnd	Gnd	Gnd	Gnd
6	Va	0V	*60V	Open
7	Va	0V	*60V	Open
8	Gnd	Gnd	Gnd	Gnd
9	M5V	0V	5V	0.86V
10	M5V	0V	5V	0.86V

*** Note: This voltage will vary in accordance with Panel Label**

Diode Mode Readings taken with all connectors Disconnected. DVM in Diode Mode.

Y-SUS P202 to X Drive P122 Plug Information

Voltage and Diode Mode Measurements for the Y-SUS Board

P202 CONNECTOR "Y-SUS" to "X-Drive" Left P122

Pin	Label	STBY	Run	Diode Mode
1	Gnd	Gnd	Gnd	Gnd
2	Gnd	Gnd	Gnd	Gnd
3	Gnd	Gnd	Gnd	Gnd
4	nc	nc	nc	nc
5	VA	0V	*60V	Open
6	VA	0V	*60V	Open
7	VA	0V	*60V	Open

*** Note: This voltage will vary in accordance with Panel Label**

Diode Mode Readings taken with all connectors Disconnected. DVM in Diode Mode.

Y-SUS P206 to Z Drive P101 Plug Information

Voltage and Diode Mode Measurements for the Y-SUS Board

P206 Connector Y-SUS to Z Drive P101 Plug Information

Pin	Label	STBY	Run	Diode Mode
1, 2	M5V	0V	5V	0.86V
3~6	Gnd	Gnd	Gnd	Gnd
7	nc	nc	nc	nc
8, 9	Er Com	0V	*89V	Gnd
10	nc	nc	nc	nc
11, 12	VS	0V	*193V	Open

*** Note: This voltage will vary in accordance with Panel Label**

Diode Mode Readings taken with all connectors Disconnected. DVM in Diode Mode.

P101 Y-SUS 15V and 5V to Control board P111 Information

Voltage Measurements for the Y-SUS Board

Y-SUS Board B+ checks for the P101 connector.

FS201
5V to run the Control Board.
Leaves the Control Board on P101 pins 4~7.
Can also be checked at J843 M5V TP.

Standby: 0V Run: 5V

Diode Check: 0.86V

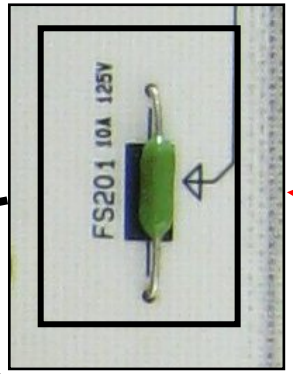
FS501 and 15V Test Point
15V to run the Z-SUS Board.
Routed out P101 to the Control Board.
Leaves the Control Board on P101 pins 11 and 12.
Can also be checked at J642 15V TP.

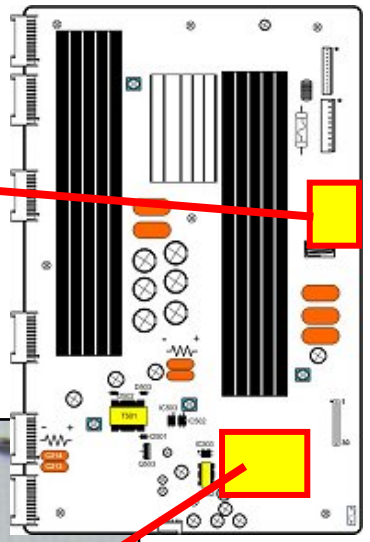
Standby: 0V Run: 15V

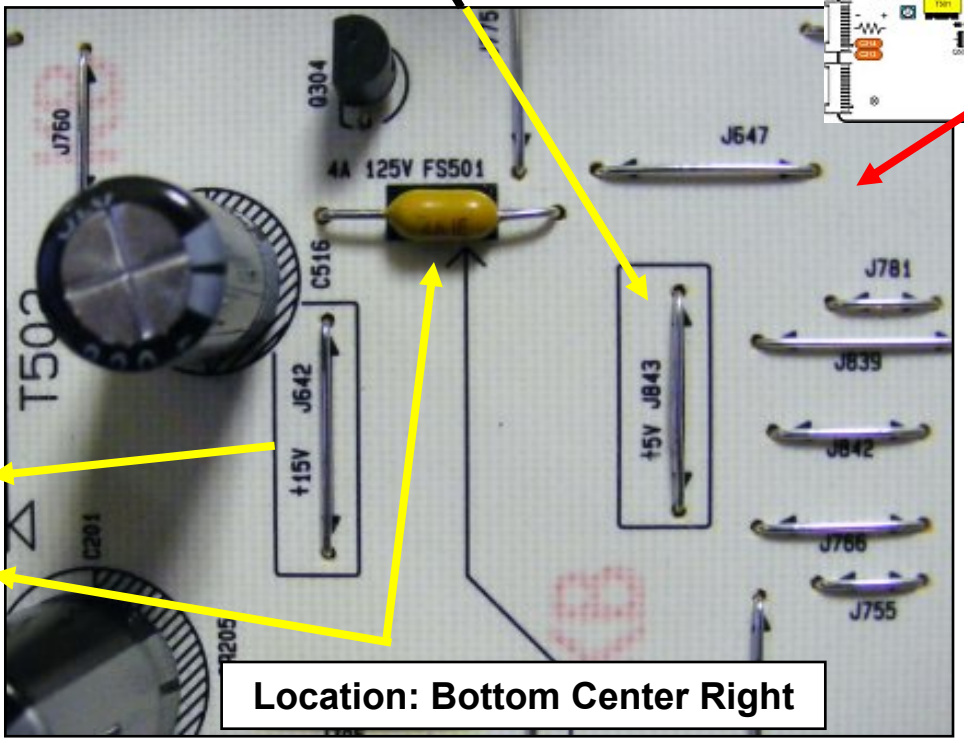
Diode Check: Open

Location: Just below P201

Location







Location: Bottom Center Right

Y-SUS Floating Ground (15V) and (5V) Checks

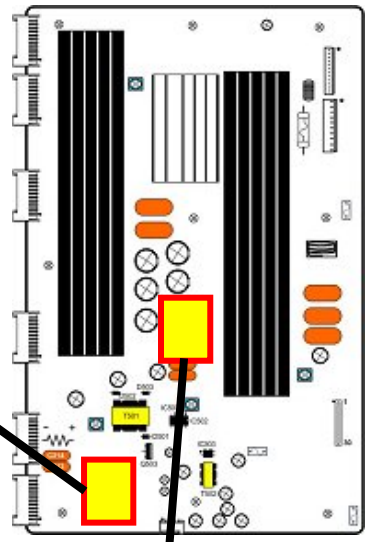
Voltage Measurements for the Y-SUS Board

Floating Ground checks must be made from Floating Ground. Use any pin on P204, P203, P205 or P208.

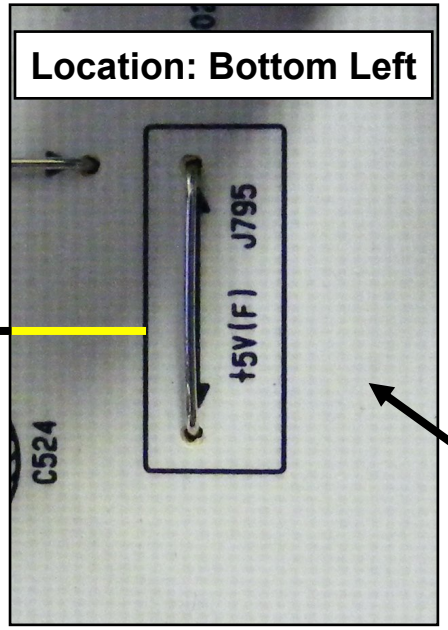
FG5V Test Point
Floating Ground referenced 5V. Used for low voltage signal processing on the Y-Drive board. Leaves the Y-SUS board on P207 pins 8 and 9. AND P209 pins 5 and 5.
Checked at J795 (+5V (F) Test Point.

Standby: 0V Run: 5V Diode Check: 1.94V

Location



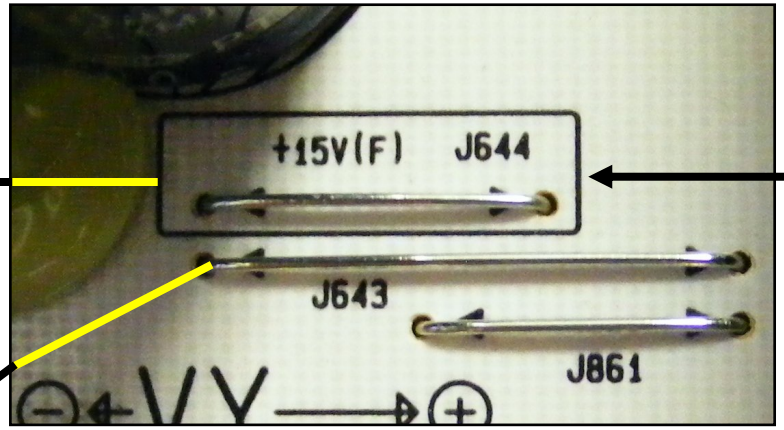
Location: Bottom Left



FG15V Test Point
FG15V to develop the Y-Drive signal.

Checked at J644 (+15V (F) Test Point.

Standby: 0V Run: 15.2V Diode Check: 1.5V



Floating Ground J643

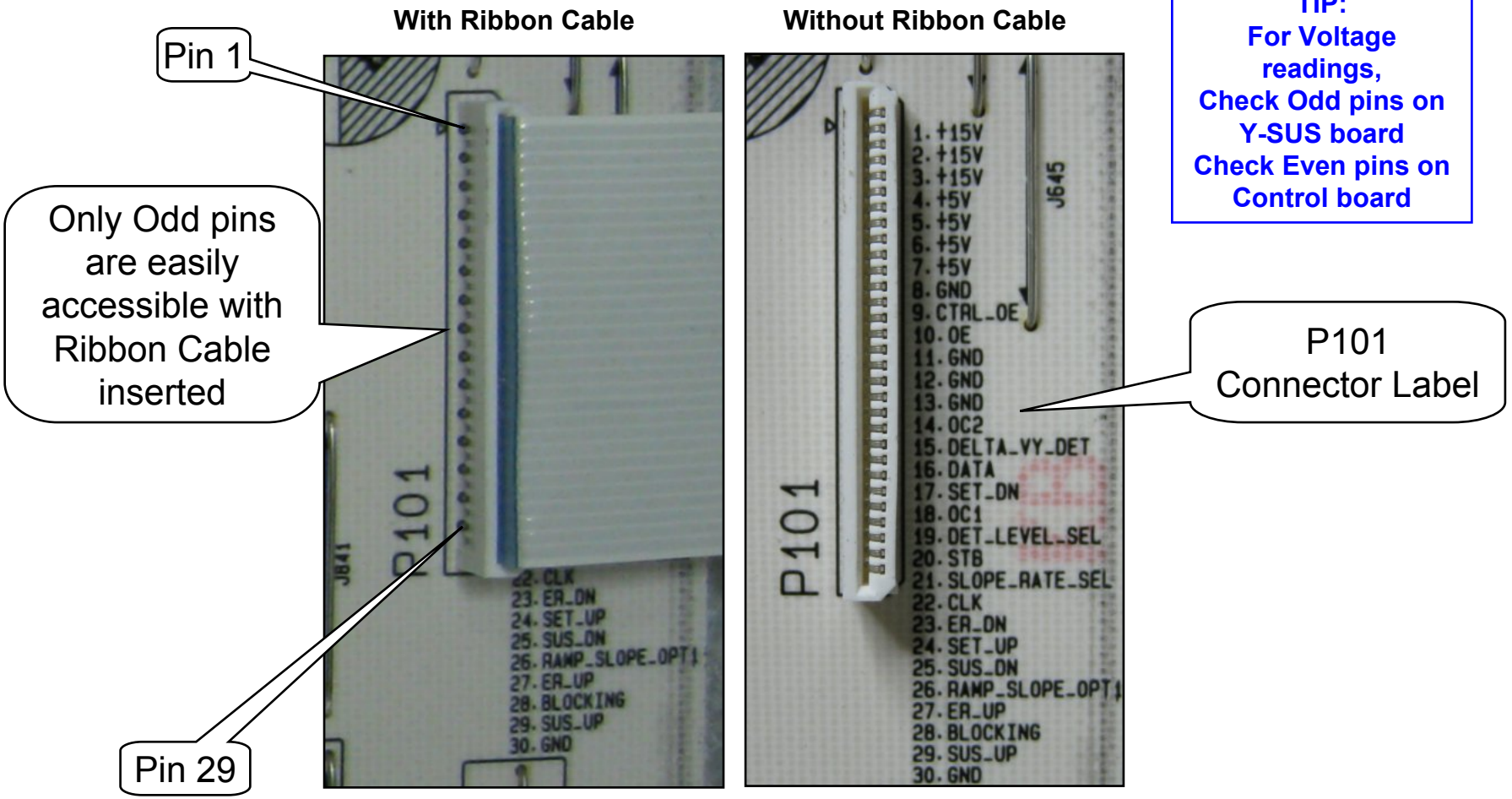
Location: Bottom Center of the two large black heat sinks.

Y-SUS P101 to Control P111 Plug Information (Tip)

See next page For Voltage readings

"Y-SUS" P101 CONNECTOR to "Control board" P111 (30 Pin Connector)

TIP:
For Voltage readings, Check Odd pins on Y-SUS board Check Even pins on Control board



Diode Mode Readings taken with all connectors Disconnected. DVM in Diode Mode.

Y-SUS P101 to Control P111 Plug Voltage Checks

TIP: For Voltage readings,
Check Odd pins on Y-SUS board
Check Even pins on Control board

"Y-SUS" P101 CONNECTOR to "Control" P111

Pin	Label	Run	Diode Mode
1	15V	17.04V	1.37V
3	15V	17.04V	1.37V
5	5V	5V	2V
7	5V	5V	2V
9	CTRL_OE	0.1V	1.3
11	Gnd (Y Enable)	0V	1.78V
13	Gnd	Gnd	Gnd
15	Delta VY Det	1.99V	0.9V
17	Set On	0.5V	0.9V
19	Det Level Sel	1.29V	0.9V
21	Slope Rate Sel	0.17V	0.9V
23	ER DN	0.114V	0.9V
25	SUS DN	2.6V	0.9V
27	ER UP	0.14V	0.9V
29	YSUS UP	0.11V	0.9V

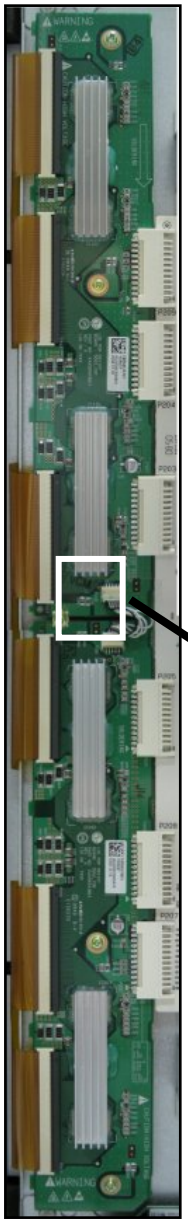
Pin	Label	Run	Diode Mode
2	15V	17.04V	1.37V
4	5V	4.95V	2V
6	5V	4.95V	2V
8	Gnd	Gnd	Gnd
10	OE	Gnd	Gnd
12	Gnd	Gnd	Gnd
14	OC2	1.82V	0.9V
16	Data	0V	0.9V
18	OC1	1.44V	0.9V
20	STB	1.45V	0.9V
22	CLK	0.6V	0.9V
24	SET UP	024V	0.9V
26	Ramp Slope OPT 1	3.12V	0.9V
28	Blocking	1.1V	0.9V
30	Gnd	Gnd	Gnd

There are No Stand By Voltages on this Connector

Diode Mode Readings taken with all connectors Disconnected. DVM in Diode Mode.

Y-DRIVE BOARD SECTION

(Y-Drive Explained)

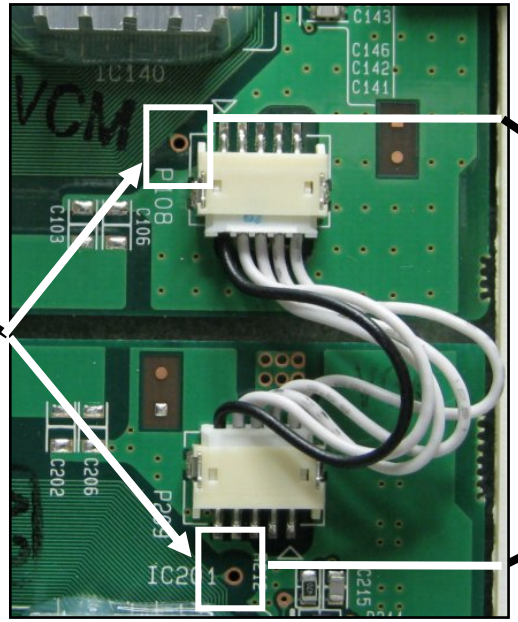


Y-Drive Boards work as a path supplying the Sustain and Reset waveforms which are made in the Y-Sustain board and sent to the Panel through Scan Driver IC's.

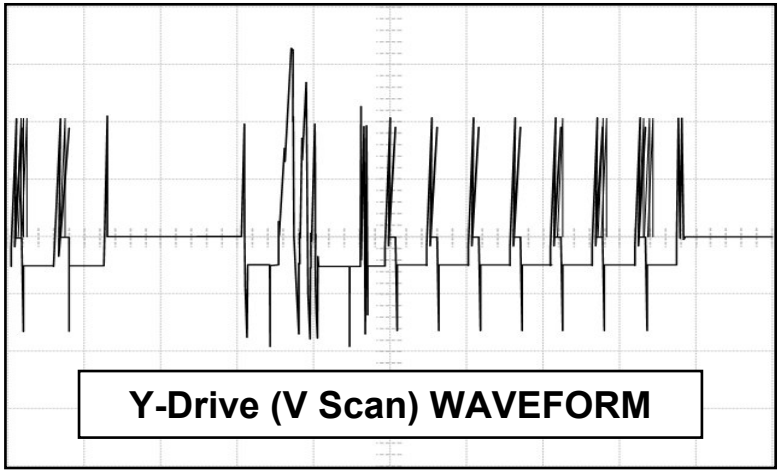
The Y-Drive Boards supply a waveform which selects the horizontal electrodes sequentially starting at the top and scanning down the panel.

* 50PQ30 uses 8 Driver ICs on 2 Y-Drive Boards

TIP:
See additional Service Tips beginning on page 131.



Y-Drive WAVEFORM TEST POINTS



Y-Drive (V Scan) WAVEFORM

Warning: To facilitate scope attachment, solder a small wire (Stand Off) at this point. Be very careful, these are fragile and can peal off with excessive heat or stress.

Upper Y-Drive Layout

TIP:
The connectors to the Y-SUS board are very easy to misalign and plugged in. The Connector will be below the actual pins on the Y-SUS. Look carefully. See Tip section page 133-134.

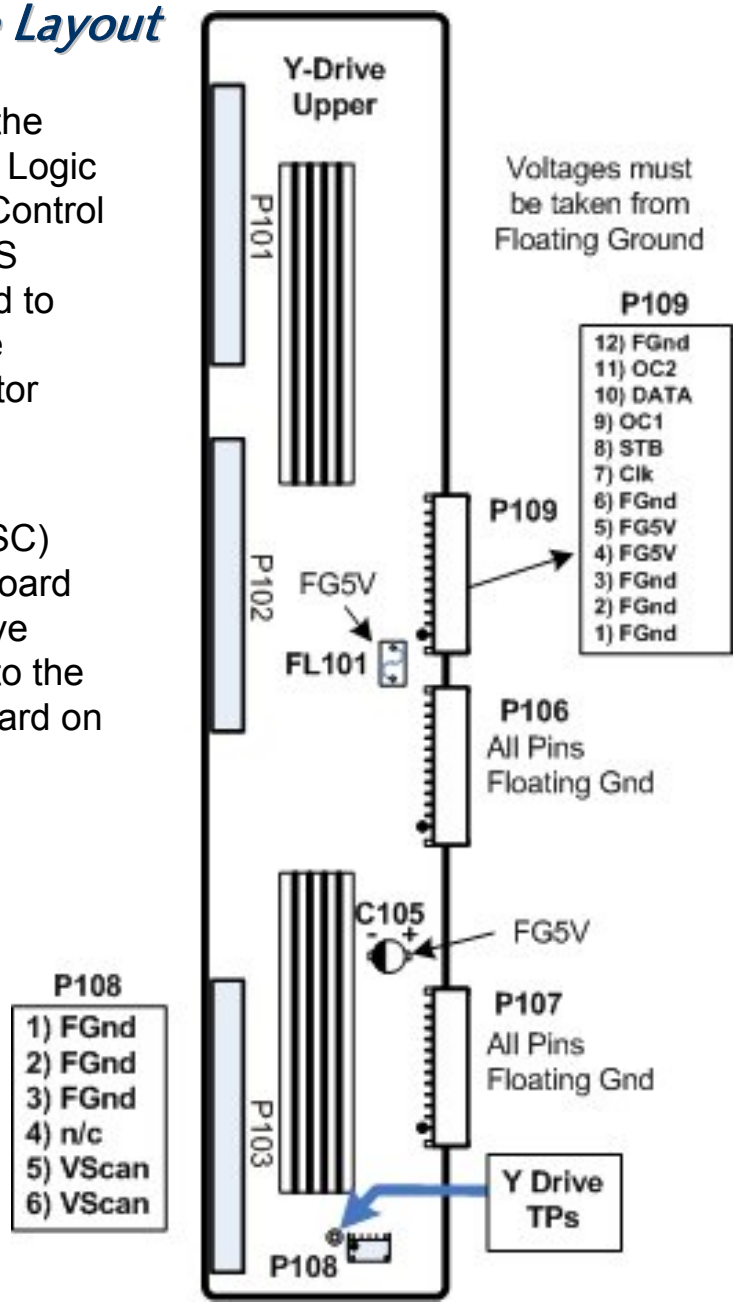


FG5V Volts from the Y-SUS board and Logic Signals from the Control through the Y-SUS board are supplied to the Upper Y-Drive Board on Connector P109.

Y-Drive signal (VSC) from the Y-SUS board through the Y-Drive lower is supplied to the Upper Y-Drive Board on Connector P108.

PANEL SIDE

Y-SUS SIDE

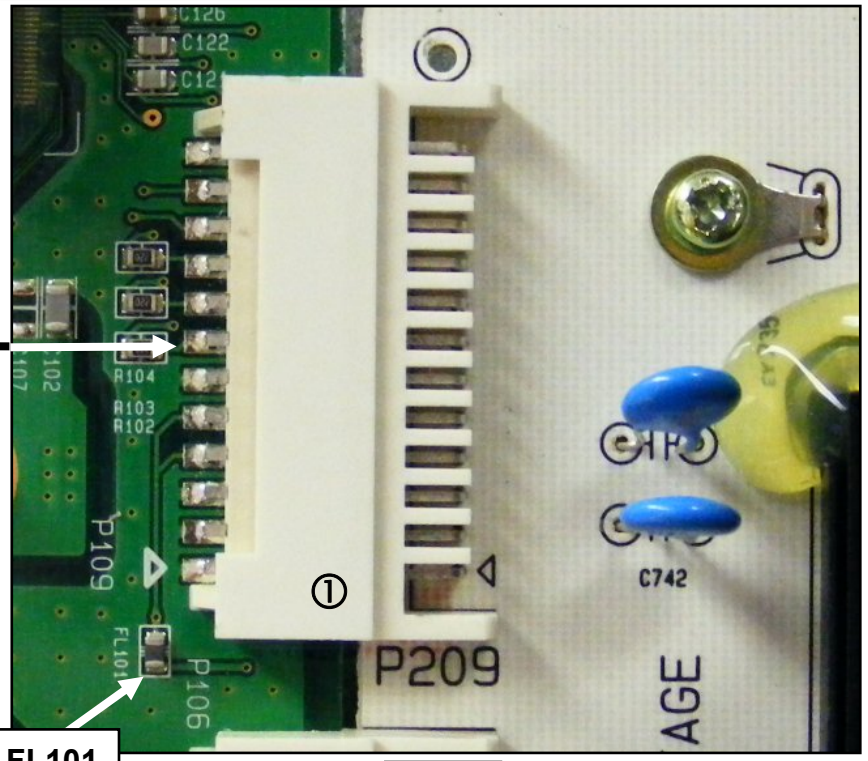


Upper Y-Drive P109 (Top Connector) Explained

P109 Pins 7, 8, 9, and 10 are Logic Signals from the Control board routed through the Y-SUS to the Y-Drive upper.
Between the Y-Drive upper and lower is P108/P209 which carries the Y-Drive (Scan) signal from the lower to the upper.

FG5V (+5V F) measured from Pins 4 or 5 to Floating Gnd
Pins 1~3, 6 or 11

11) Ground (F)
10) DATA
9) OC1
8) STB
7) CLK
6) Ground (F)
5) 5V VF
4) 5V VF
3) Ground (F)
2) Ground (F)
1) Ground (F)



Top Connector P109

Upper Y-Drive Upper P109 Diode Mode Testing

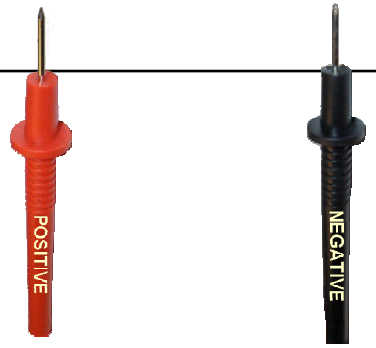
Checking the Upper Y-Drive BOARD P109
NOTE: Disconnected from the Y-SUS Board

TIP: This test will check "All" scan buffers Low Voltage input side on the Y-Drive Upper board.

All Readings from Floating Ground (Pin 1~3, 6 or 12)

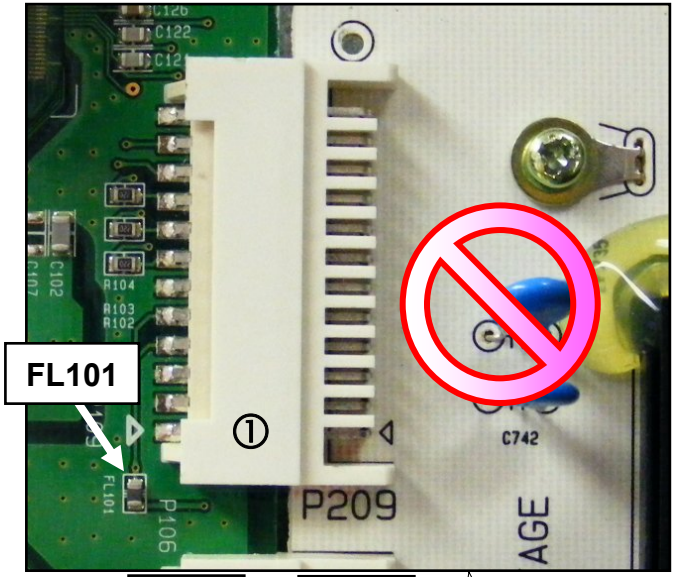
		RED LEAD Blk Lead FG	BLACK LEAD Red Lead FG
Floating Gnd	12) Ground (F)	0V	0V
	11) OC2	Open	0.52V
	10) DATA	Open	0.67V
	9) OC1	Open	0.54V
	8) STB	Open	0.54V
Floating Gnd	7) CLK	Open	0.54V
	6) Ground (F)	0V	0V
	5) 5V VF	1.94V	0.43V
Floating Gnd	4) 5V VF	1.94V	0.43V
Floating Gnd	3) Ground (F)	0V	0V
Floating Gnd	2) Ground (F)	0V	0V
	1) Ground (F)	0V	0V

Meter in the Diode Mode



Y-Drive Upper Board

Y-SUS Board



Y-SUS Board should be disconnected for this test.

Y-Drive Lower Layout

PANEL SIDE

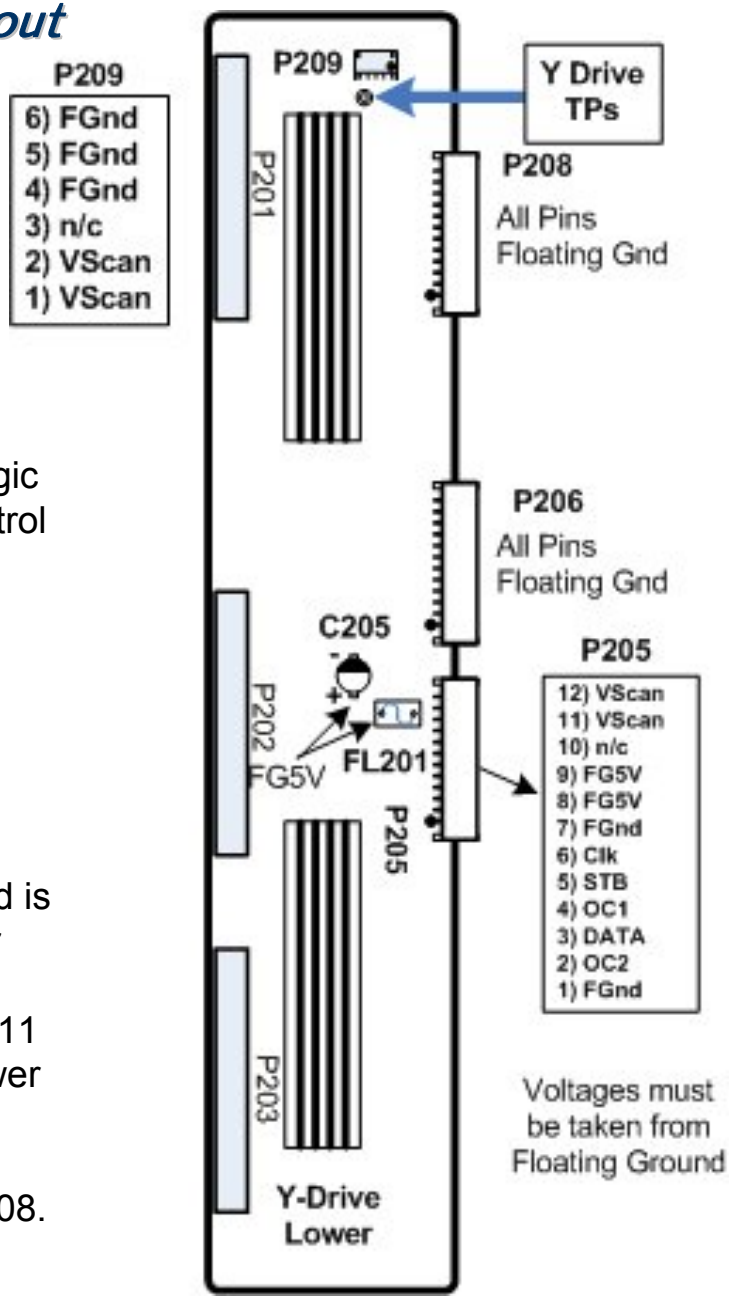
Y-SUS SIDE



TIP:
The connectors to the Y-SUS board are very easy to misalign and plugged in. The Connector will be below the actual pins on the Y-SUS. Look carefully. See Tip section page 133-134.

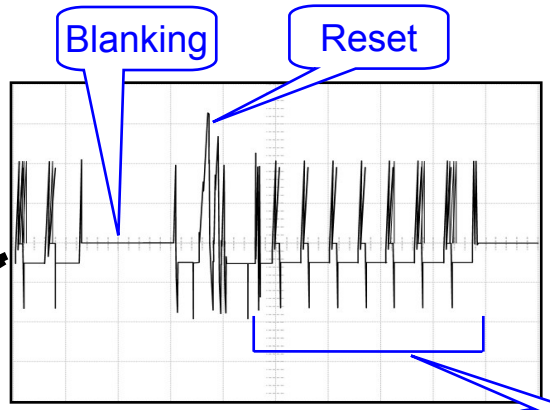
FG5V Volts from the Y-SUS board and Logic Signals from the Control through the Y-SUS board are supplied to the Lower Y-Drive Board on connector P205.

Y-Drive signal (VSC) from the Y-SUS board is supplied to the Lower Y-Drive Board on connector P205 pins 11 and 12. Then the Lower Y-Drive delivers the V-Scan signal to the upper via P209 to P108.

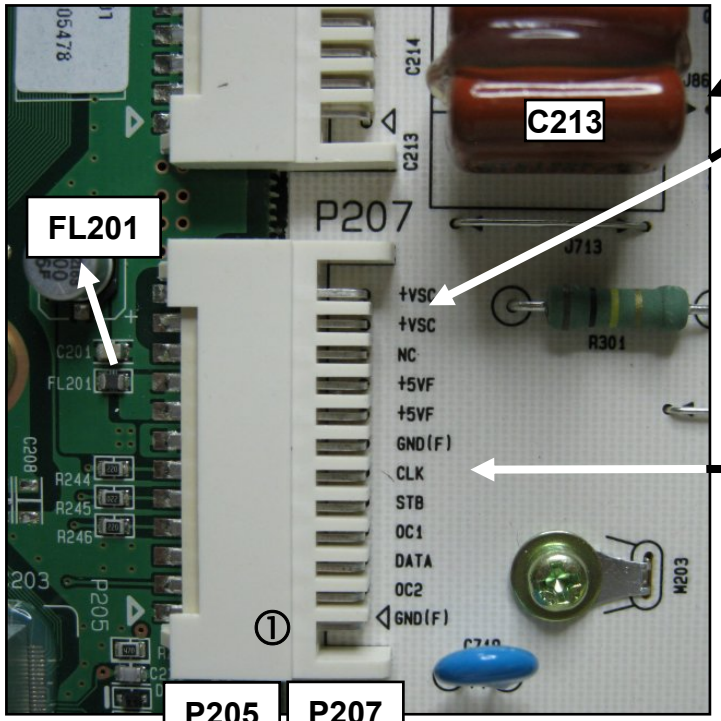


Y-Drive Lower P205 (Bottom Connector) Explained

TIP: Use P207 pins 1 or 2 or the Right Side of C213 to test for Y Scan signal if the Y-Drive boards are removed



P207 Pins 1 and 2
Y Scan signal
516V p/p



Y-Drive Board | **Y-SUS Board**

Bottom Connector P205

11) V Scan
10) V Scan
9) n/c
8) 5V VF
7) 5V VF
6) Ground (F)
5) STB
4) OC1
3) DATA
2) OC2
1) Ground (F)

FG5V measured from
Pins 7 or 8
Floating Gnd
Pins 1 or 6

P207 Pins 2, 3, 4, and 5 are Logic (Drive) Signals to the Y-Drive lower P209 carries the Y-Drive signals to the Upper Y-Drive board

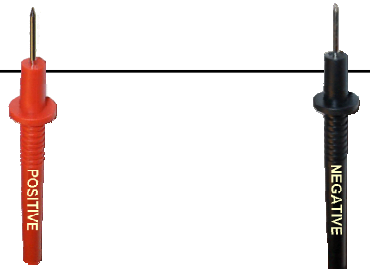
Lower Y-Drive P205 Diode Mode Testing

TIP: This test will check "All" scan buffers Low Voltage input side on the Y-Drive lower board.

Checking the Lower Y-Drive Board P205
NOTE: Disconnected from the Y-SUS board

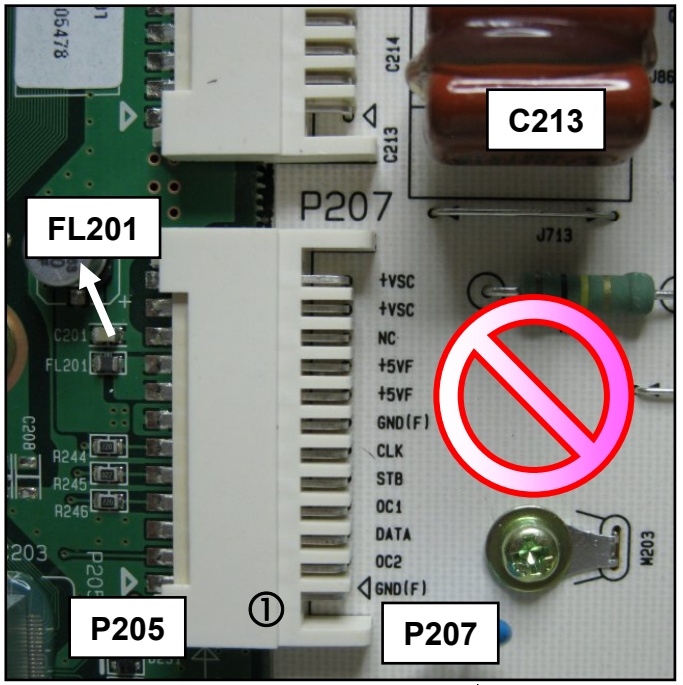
All Readings from Floating Ground (Pin 1 or 7)

		RED LEAD Blk Lead FG	BLACK LEAD Red Lead FG
Y-Drive Sig	12) V Scan	Open	1.0V
Y-Drive Sig	11) V Scan	Open	1.0V
	10) n/c	Open	Open
	9) 5V VF	Open	0.425V
	8) 5V VF	Open	0.425V
Floating Gnd	7) Ground (F)	0V	0V
	6) CLK	Open	0.538V
	5) STB	Open	0.538V
	4) OC1	Open	0.538V
	3) DATA	Open	Open
	2) OC2	Open	0.521V
Floating Gnd	1) Ground (F)	Open	0V



Meter in the Diode Mode

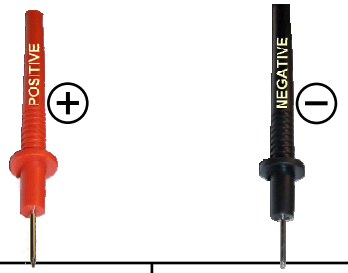
P205 of the Y-DRIVE Lower **P207 of the Y-SUS Board**



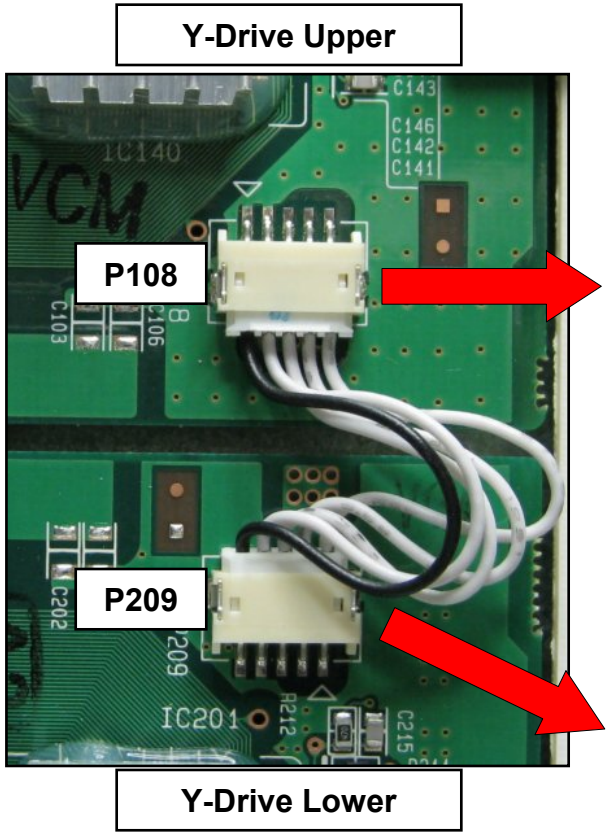
Y-SUS Board should be disconnected for this test.

Y-Drive P108 and P209 Voltage and Diode Mode Check

TIP: This test will check "All" scan buffers Input side on the board.



Voltage and Diode Mode Measurements (Taken from Floating Ground)



P108 CONNECTOR "Y-Drive Upper to Lower"

Pin	Label	Run	Diode Mode Red Lead	Diode Mode Black Lead
1	FGnd	0V	0V	0V
2	FGnd	0V	0V	0V
3	Y Scan	*134V	Open	1.2V
4	Y Scan	*134V	Open	1.2V
5	Y Scan	*134V	Open	1.2V

P209 CONNECTOR "Y-Drive Lower to Upper" ⊕ ⊖

Pin	Label	Run	Diode Mode Red Lead	Diode Mode Black Lead
1	FGnd	0V	0V	0V
2	FGnd	0V	0V	0V
3	Y Scan	*134V	Open	1.0V
4	Y Scan	*134V	Open	1.0V
5	Y Scan	*134V	Open	1.0V

Diode Mode Readings taken with all connectors Disconnected. DVM in Diode Mode.

Note: This voltage will vary in accordance with Panel Label

Removing (Panel) Flexible Ribbon Cables from Y-Drive Upper or Lower

Flexible Ribbon Cables shown are from a different model, but process is the same.

To remove the Ribbon Cable from the connector first carefully lift the Locking Tab from the back and tilt it forward (lift from under the tab as shown in Fig 1).
The locking tab must be standing straight up as shown in Fig 2.
Lift up the entire Ribbon Cable gently to release the Tabs on each end. (See Fig 3)
Gently slide the Ribbon Cable free from the connector.

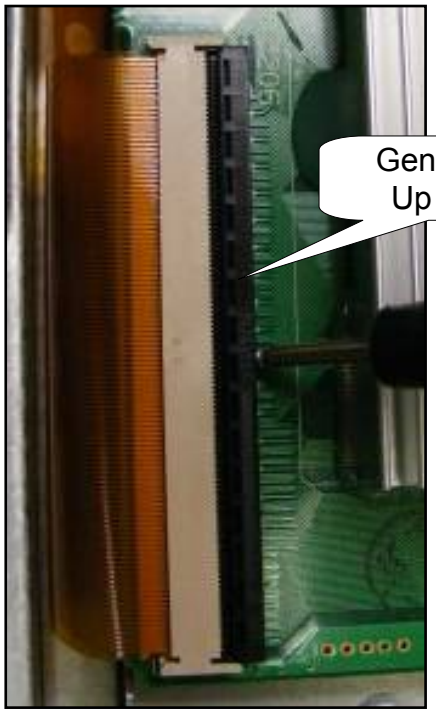


Fig 1

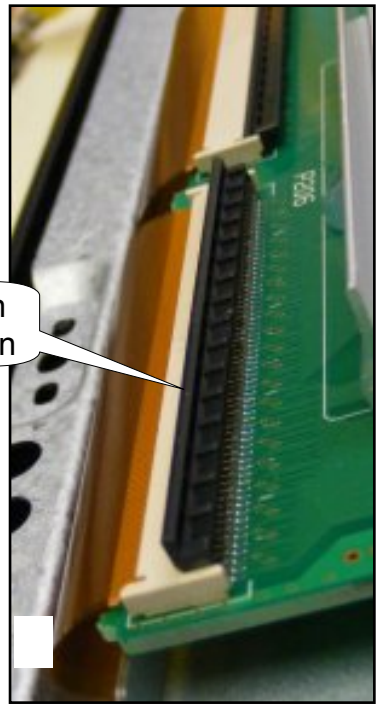


Fig 2

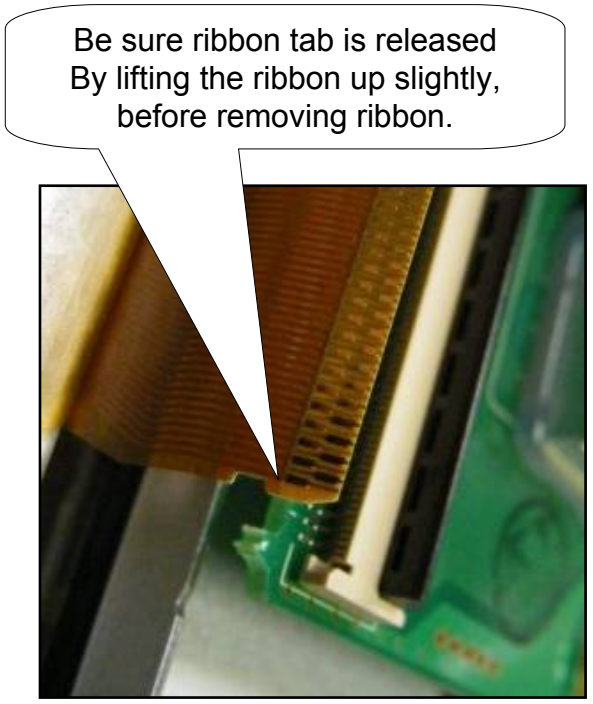


Fig 3

To reinstall the Ribbon Cable, carefully slide it back into the slot see (Fig 3), be sure the Tab is seated securely and press the Locking Tab back to the locked position see (Fig 2 then Fig 1).

Incorrectly Seated Y-Drive Flexible Ribbon Cables

The Ribbon Cable is clearly improperly seated into the connector. You can tell by observing the line of the connector compared to the FPC, they should be parallel.

The Locking Tab will offer a greater resistance to closing in the case.

Note the cable is crooked. In this case the Tab on the Ribbon cable was improperly seated at the top. This can cause bars, lines, intermittent lines abnormalities in the picture.

Remove the ribbon cable and re-seat it correctly.

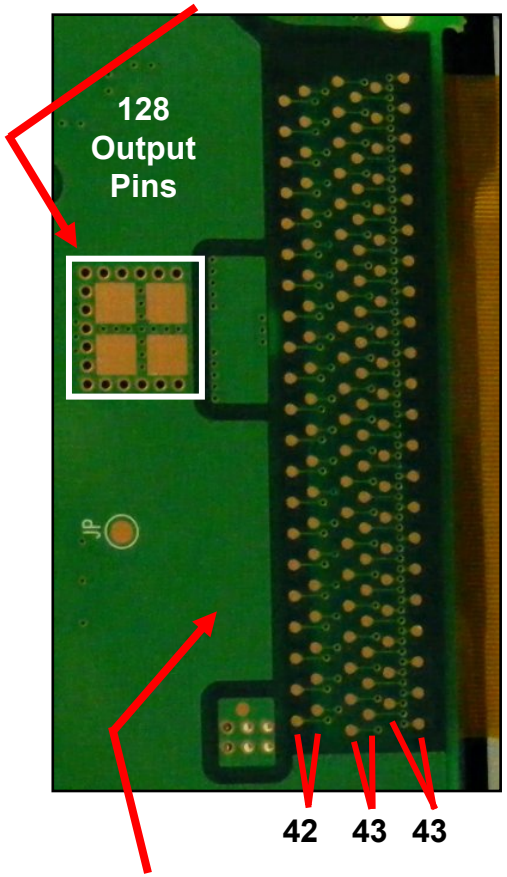


Y-Drive Buffer Troubleshooting

YOU CAN CHECK ALL 8 BUFFER ICs USING THIS PROCEDURE

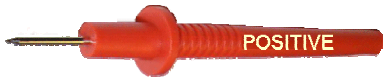
BACK SIDE OF Y-DRIVE BOARD

BUFFER IC FLOATING GROUND (FGnd)



- **Any of these output lugs can be tested.**
- **Look for shorts indicating a defective Buffer IC**

Using the "Diode Test" on the DVM, check the pins for shorts or abnormal loads.



RED LEAD ON BUFFER IC FGnd

Indicated by white outline



BLACK LEAD ON "ANY" OUTPUT LUG. READING 0.798 V



BLACK LEAD ON BUFFER IC FGnd

Indicated by white outline



RED LEAD ON "ANY" OUTPUT LUG. READING "OPEN"

128 Output Pins per/FPC (Flexible Printed Circuit)

6 Ribbon cables (Horizontal Electrodes)

768 Total Horizontal Electrodes controlling Vertical resolution

Z-SUS SECTION

This Section of the Presentation will cover troubleshooting the Z-SUS Board Assembly. Upon completion of this section the Technician will have a better understanding of the circuit and be able to locate voltage and diode mode test points needed for troubleshooting and all alignments.

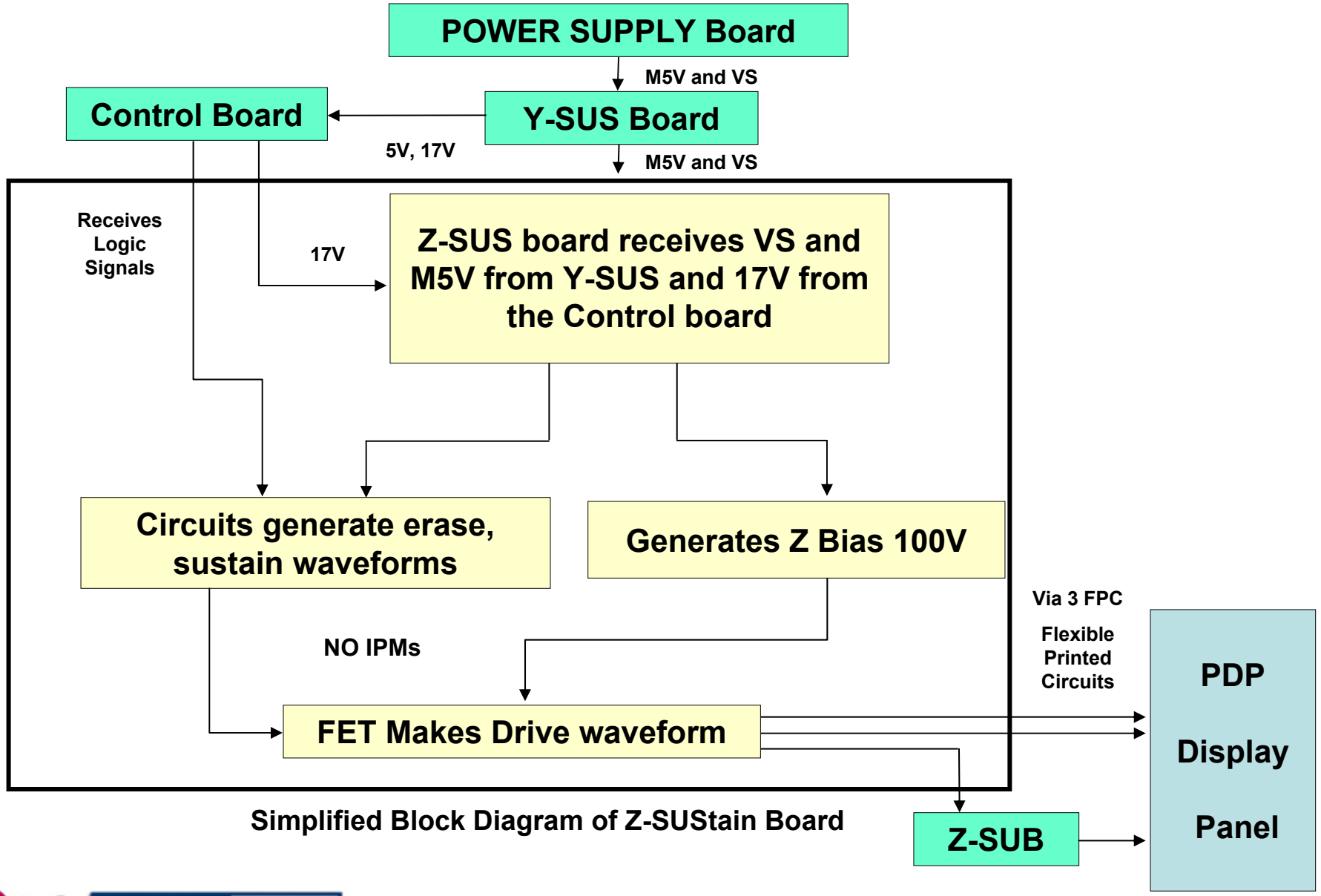
Locations

- DC Voltage and Waveform Test Points
- Z BIAS Alignment
- Diode Mode Test Points

Operating Voltages

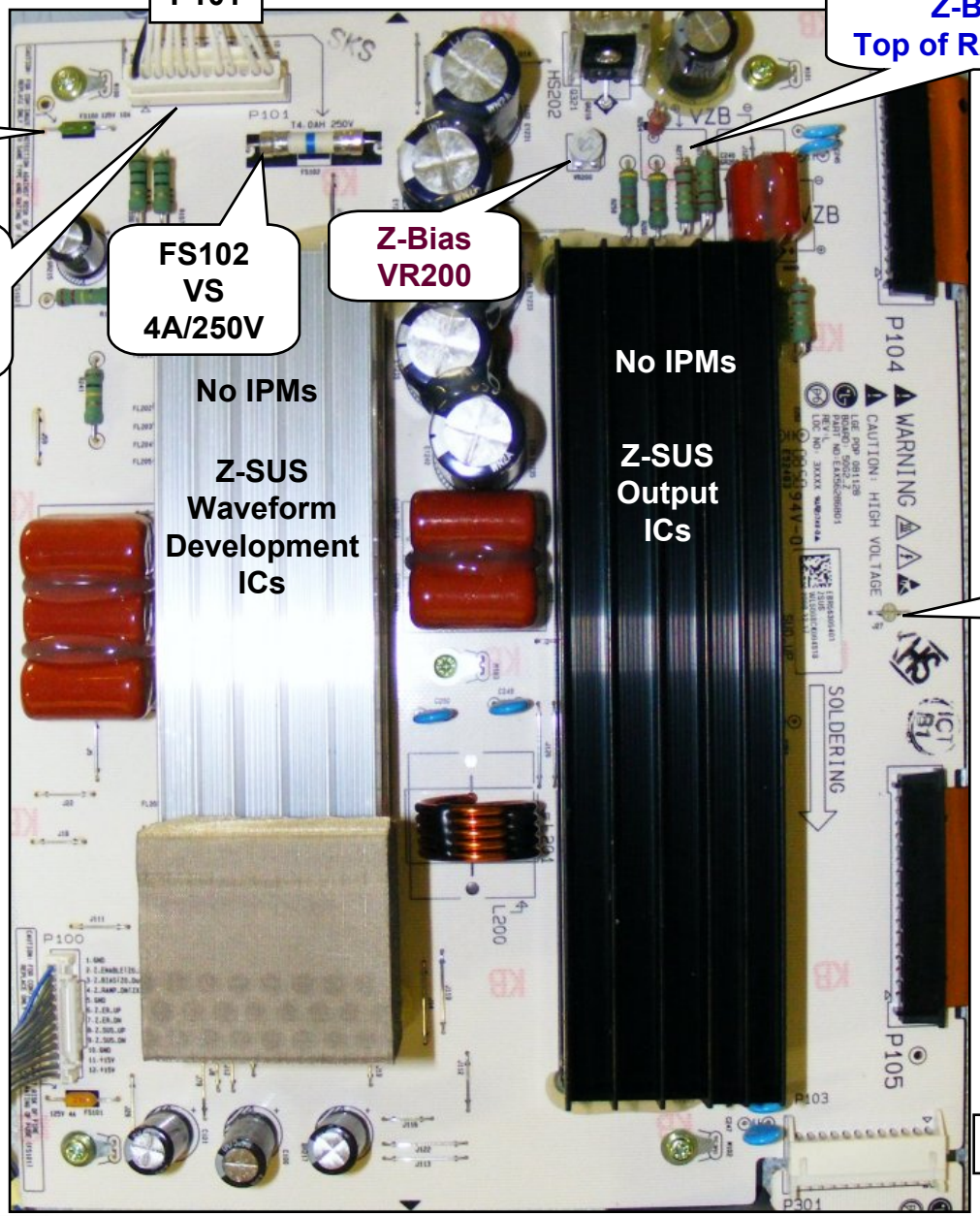
Power Supply Supplied	VS
	M5V
Control Board Supplied	
But developed on the Y-SUS	17V
Developed on Z-SUS	Z Bias

Z-SUS Block Diagram



Simplified Block Diagram of Z-SUStain Board

Z-SUS SECTION

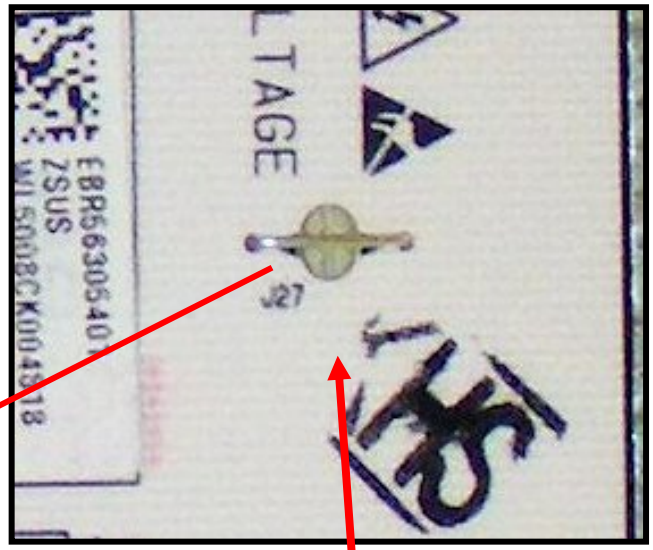


Z-SUS Waveform

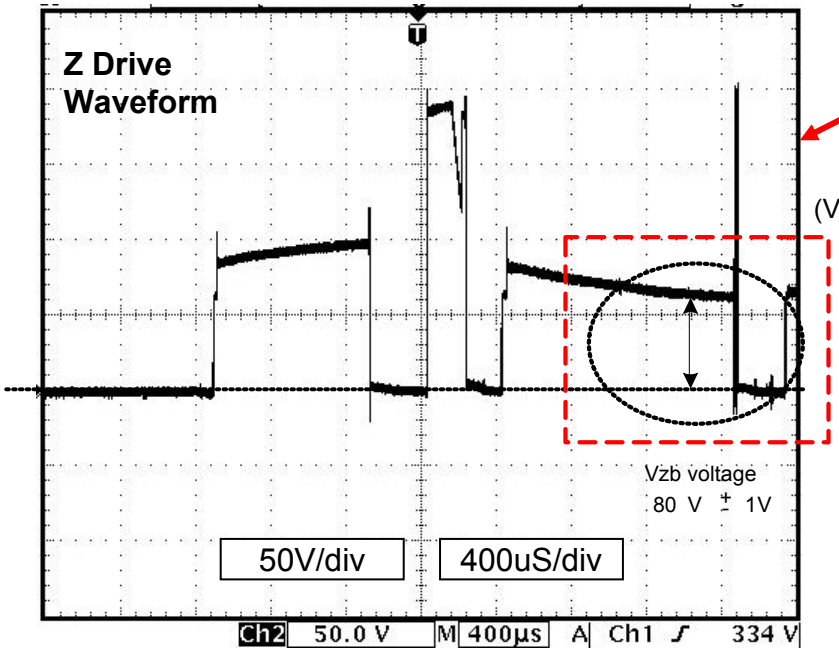
The Z-SUS (in combination with the Y-SUS) generates a SUSTAIN Signal and an ERASE PULSE for generating SUSTAIN and DISCHARGE in the Panel.

This waveform is supplied to the panel through FPC (Flexible Printed Circuit) P104, P105 and also P103 to the Z-SUB which connects to the panel via P302.

TIP: The Z-Bias (VZB) Adjustment is a DC level adjustment. This is only to show the effects of Z-Bias on the waveform.



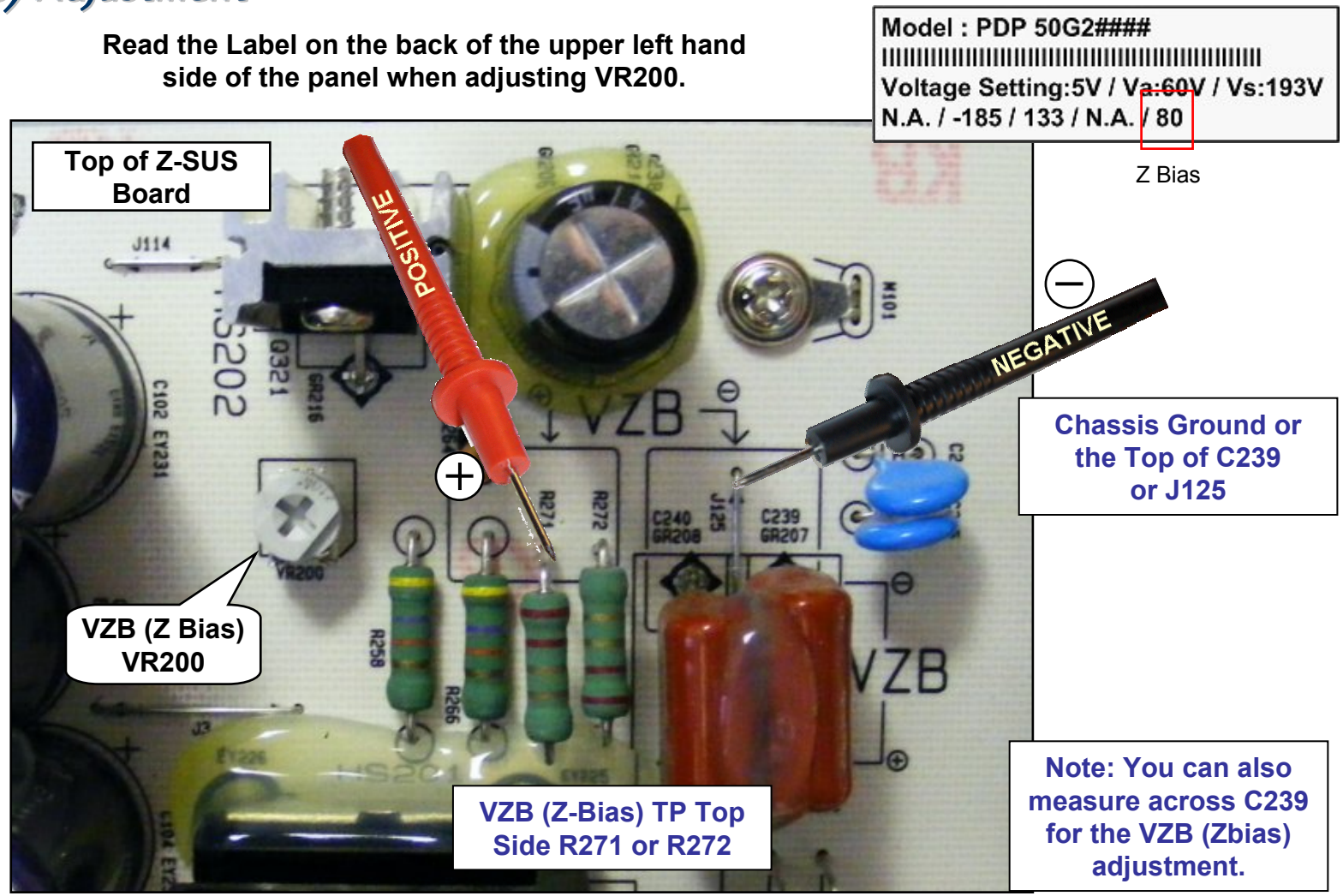
Oscilloscope Connection Point.
J27 to check Z Output waveform.
Right Hand side Center.



This Waveform is just for reference to observe the effects of Zbz adjustment

VZB (Z-Bias) Adjustment

Read the Label on the back of the upper left hand side of the panel when adjusting VR200.



Set should run for 15 minutes, this is the "Heat Run" mode.
Set screen to "White Wash" mode or 100 IRE White input.

Measured from Chassis Ground

Adjust VZ (Z-Bias) to Panel Label (± 1V)

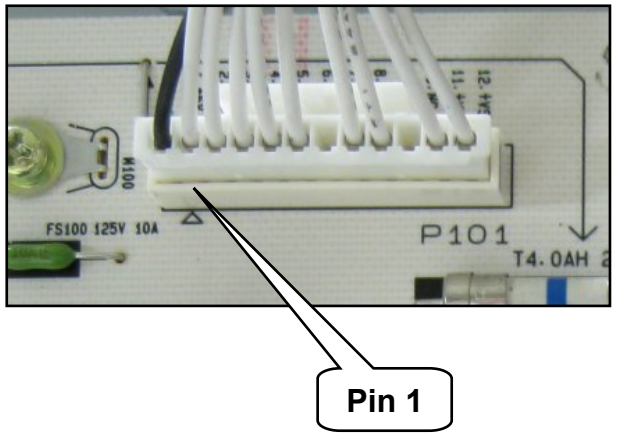
Connector P101 to Y-SUS P206 Voltages and Diode Checks

Voltage and Diode Mode Measurements

P101 CONNECTOR "Z-SUS" to "Y-SUS" P206

Pin	Label	Run	Diode Mode
1, 2	M5V	5V	Open
3~6	Gnd	Gnd	Gnd
7	n/c	n/c	n/c
8, 9	ER COM	*94.9V	Open
10	n/c	n/c	Open
11, 12	VS	*193V	Open

Location: Top Left



*** Note: This voltage will vary in accordance with Panel Label**

There are no Stand-By voltages on this connector

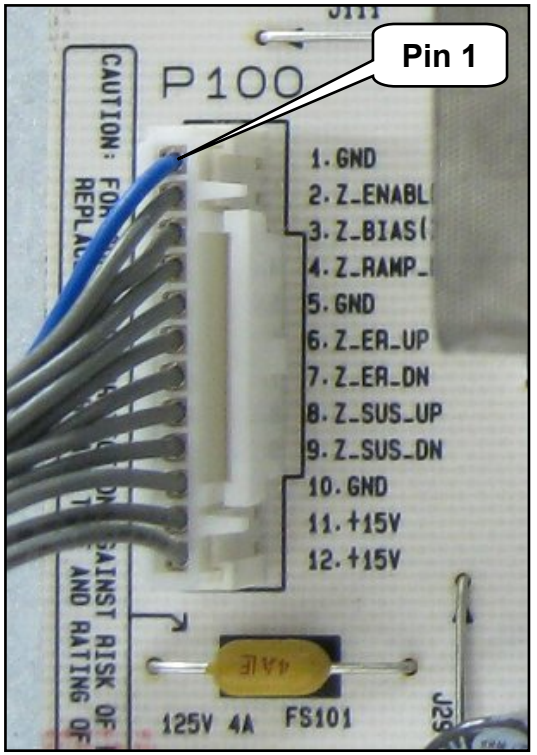
Diode Mode Readings taken with all connectors Disconnected. DVM in Diode Mode.

Connector P100 to Control P101 Voltages and Diode Checks

Voltage and Diode Mode Measurements

P100 CONNECTOR "Z-SUS" to "Control" P101

Pin	Label	Run	Diode Mode
1	Gnd	Gnd	Gnd
2	Z Enable	0.05V	Open
3	Z Bias	1.8V	Open
4	Z Ramp	1.7V	Open
5	Gnd	Gnd	Gnd
6	Z ER UP	0.3V	Open
7	Z ER DN	0.4V	Open
8	Z-SUS UP	0.2V	Open
9	Z-SUS DN	0.8V	Open
10	Gnd	Gnd	Gnd
11	+15V	17V	Open
12	+15V	17V	Open



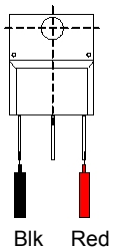
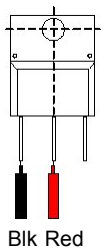
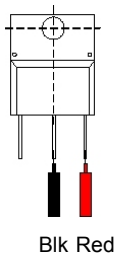
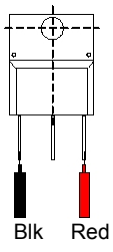
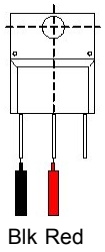
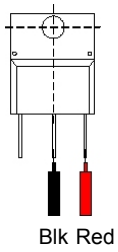
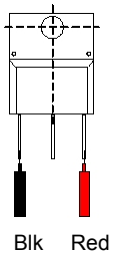
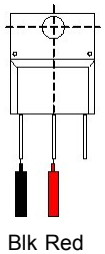
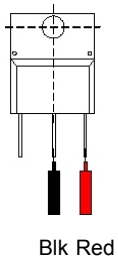
Location: Bottom Left hand side

There are no Stand-By voltages on this connector

Diode Mode Readings taken with all connectors Disconnected. DVM in Diode Mode.

Z-SUS How to Check the Output FETs 1 of 2

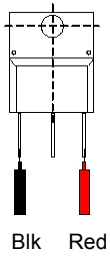
Name is printed on the components. Readings "In Circuit".

20NF20 **Q311**	 Shown: Short Reverse: Short 0.1 Ohms	 Shown: Open Reverse: Open	 Shown: 0.52V Reverse: Open
33N25T **Q312**	 Shown: 0.678V Reverse: Open	 Shown: Open Reverse: Open	 Shown: 0.52V Reverse: Open
RF2001 **D301 D305** **D302 D306** **D303 D311** **D304 D312**	 Shown: Short Reverse: Short 0.1 Ohms	 Shown: 0.36V Reverse: Open	 Shown: 0.36V Reverse: Open

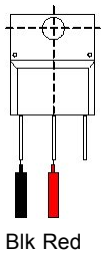
Z-SUS How to Check the Output FETs 2 of 2

Name is printed on the components. Readings "In Circuit".

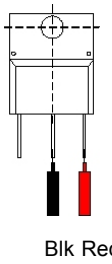
45F122
[A]Q302 Q315
[A]Q304 Q317
[B]Q313 Q318
[B]Q314



Shown: 1.496V
[A] 0.6V
Reverse: 0.782V

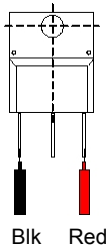


Shown: Open
Reverse: 1.14V
[B]0.95V

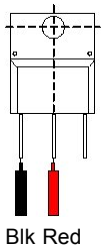


Shown: 0.364V
[A] 0.49V
Reverse: Open

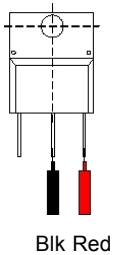
5N50C
Q321



Shown: 1.22V
Reverse: Open

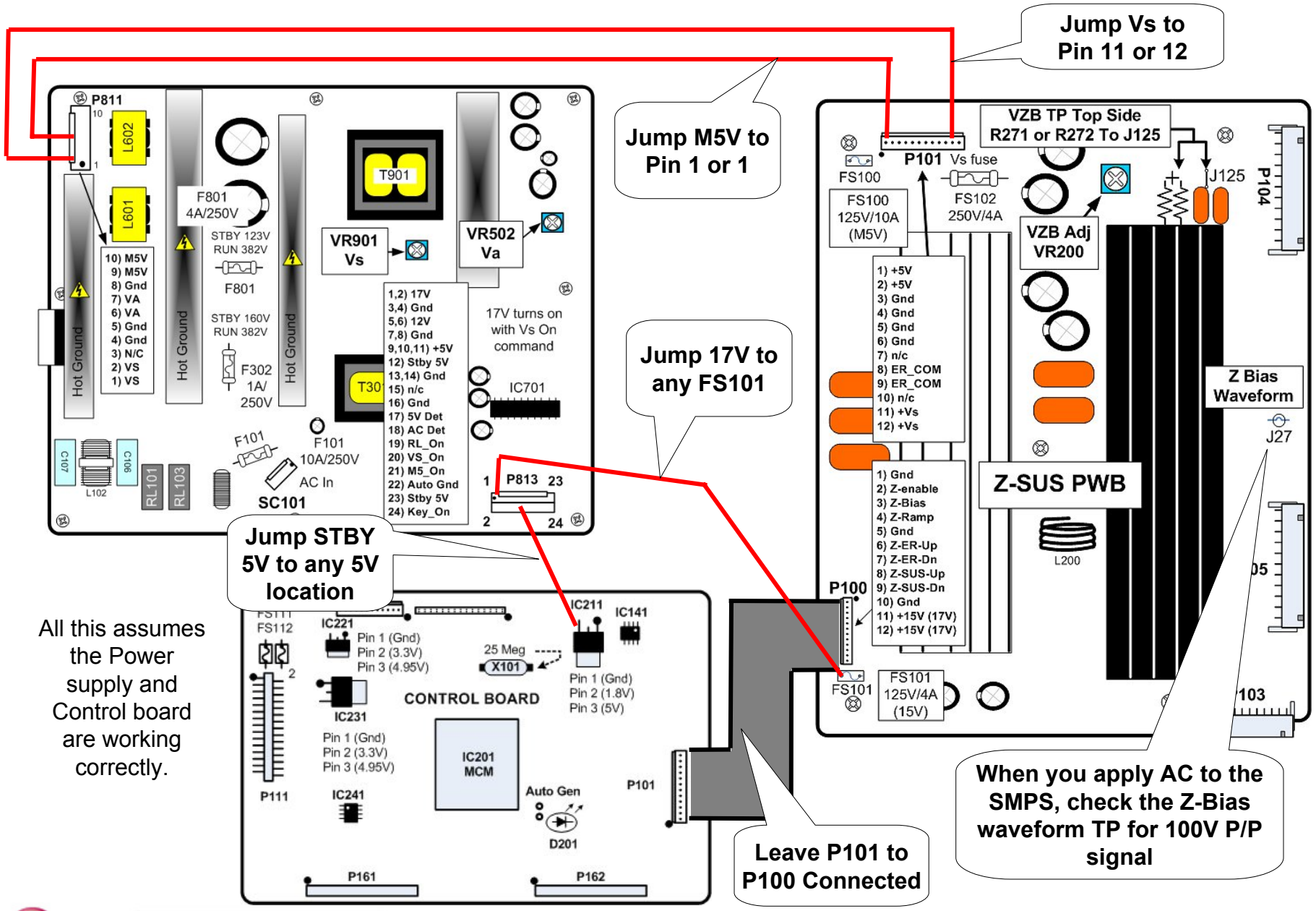


Shown: Open
Reverse: Open



Shown: 0.536V
Reverse: Open

Z-SUS How to Check the Z-SUS if the Y-SUS Has Failed



CONTROL BOARD SECTION

This Section of the Presentation will cover troubleshooting the Control Board Assembly. Upon completion of this section the Technician will have a better understanding of the circuit and be able to locate voltage and diode mode test points needed for troubleshooting.

- DC Voltage and Waveform Test Points
- Diode Mode Test Points

Signals

Main Board Supplied — Panel Control and LVDS Signals

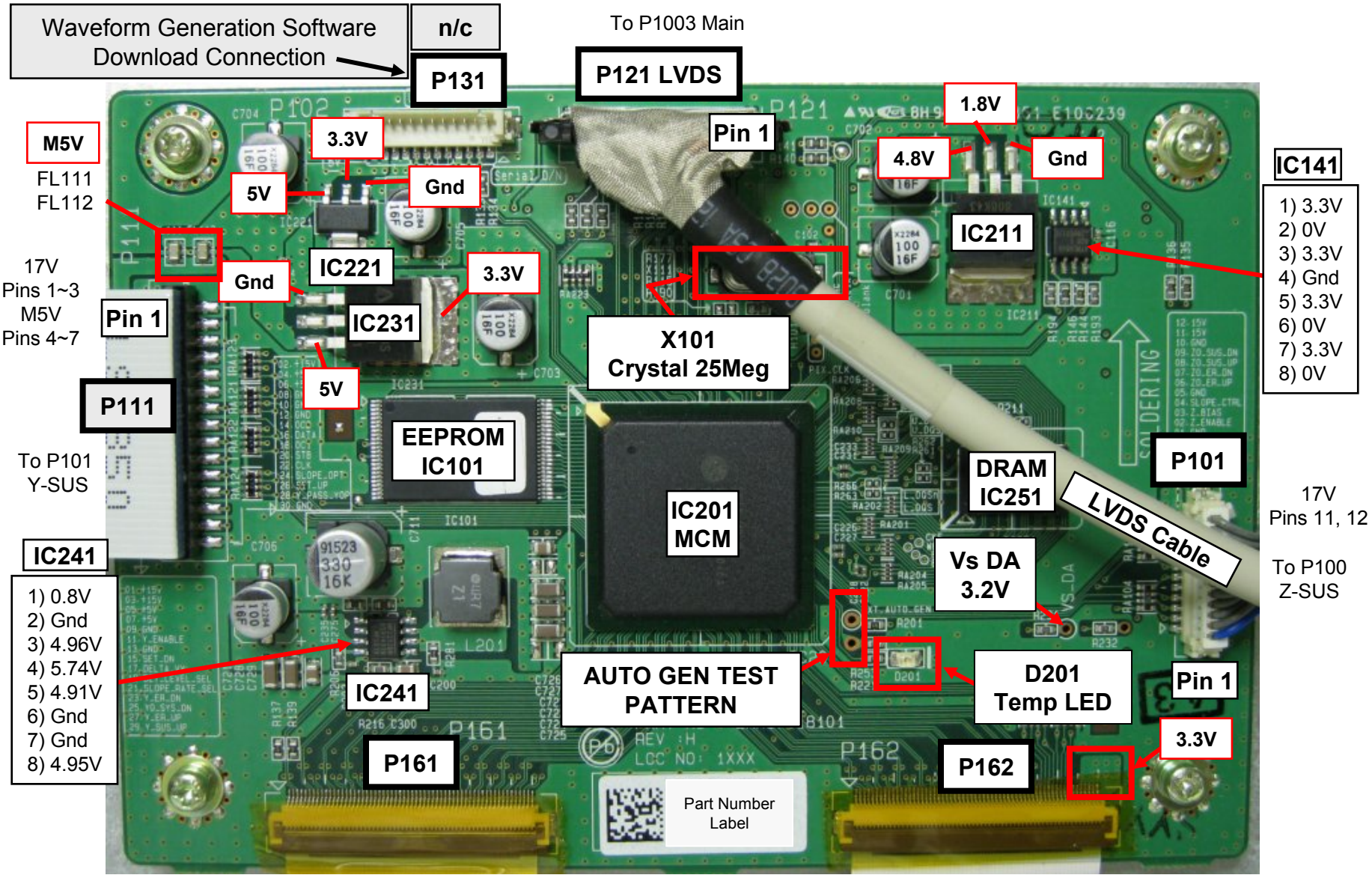
Control Board Generated — Y-SUS and Z-SUS Drive Signals (Sustain)
X Board Drive Signals (RGB Address)

Operating Voltages

Y-SUS Supplied — +5V (M5V) Developed on the SMPS
+17V (Routed to the Z-SUS)

Developed on the Control Board — +1.8V for internal use
+3.3V for internal use
+3.3V for the X-Boars (TCPs)

Control Board Component Identification

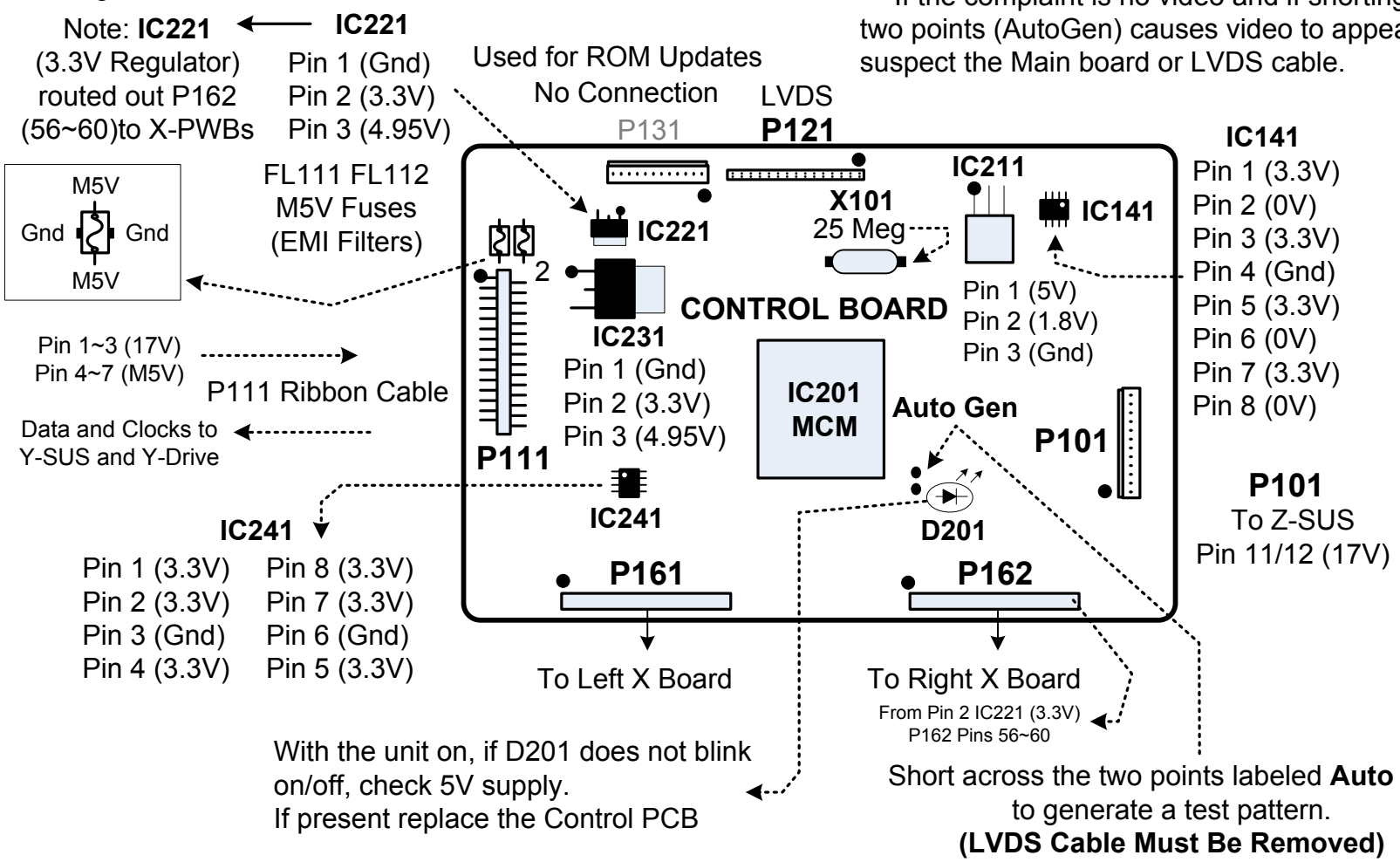


50PQ30 CONTROL BOARD (Troubleshooting Tips)

Unplug all connectors. Jump 5V from SMPS (P813 pins 9~12) to pin 1 of IC211. Observe LED. If it blinks, most likely Control PWB is OK. FL111 and FL112 should be checked.

Disconnect P201 from the Y SUS Board and connect a Jumper from Pin 10 of P812 (M5V) to Pin 10 P201 (5V). The 5V will be routed to the Control Board via FS201, Ribbon Cable P101 on the Y SUS Board to P111 on the Control board. Then through FL111 and FL112 to all regulators on the Control Board. For Control Board operation verification, watch D201 for blinking.

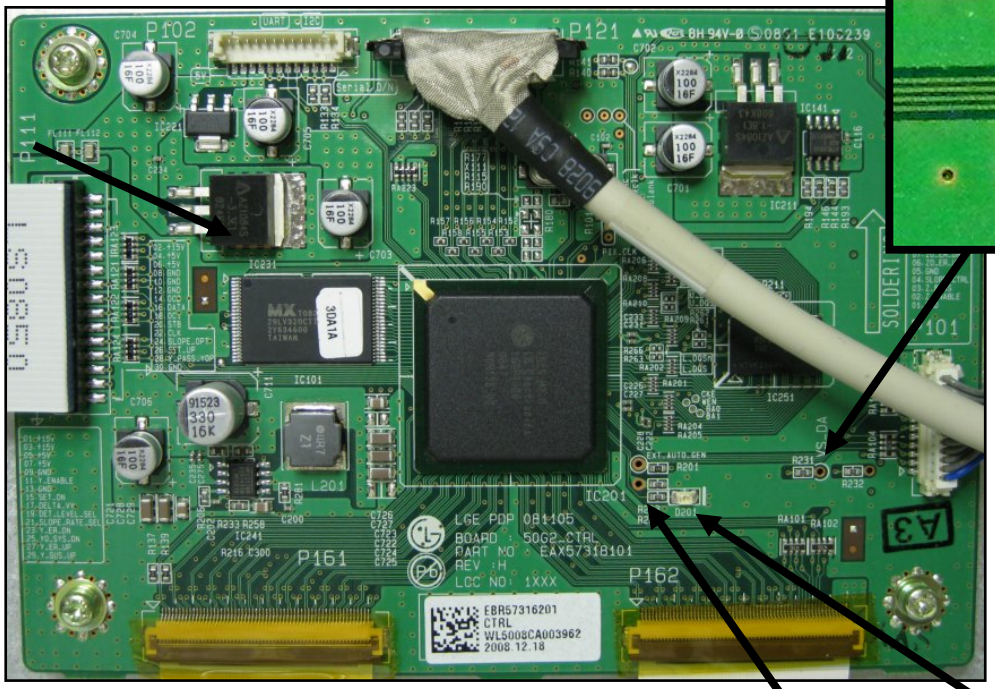
* If the complaint is no video and if shorting the two points (AutoGen) causes video to appear suspect the Main board or LVDS cable.

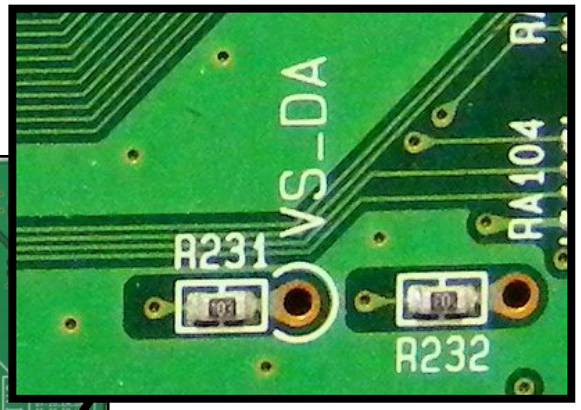


Control Board Additional Troubleshooting Tips

For quick Control board test. (All connectors Disconnected).

Jump 5V from Power Supply to IC201 Pin 3. (Bottom Pin)
If the LED blinks, Pretty much guaranteed, Control Board is OK.



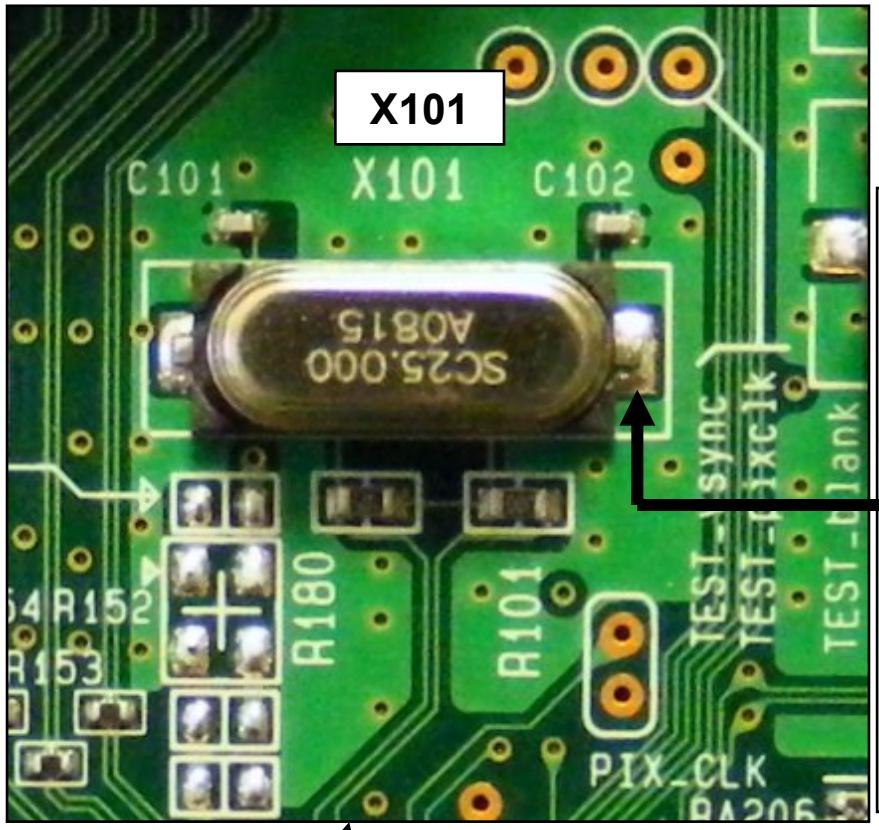


Confirm B+ to Control the Control Board
VS_DA
3V ~ 3.3V
(Note, this TP can also be Used as an External Trigger For scope when locking onto the Y-Drive signal).

Quick observation Of LED blinking Tell if the Control Board is running.

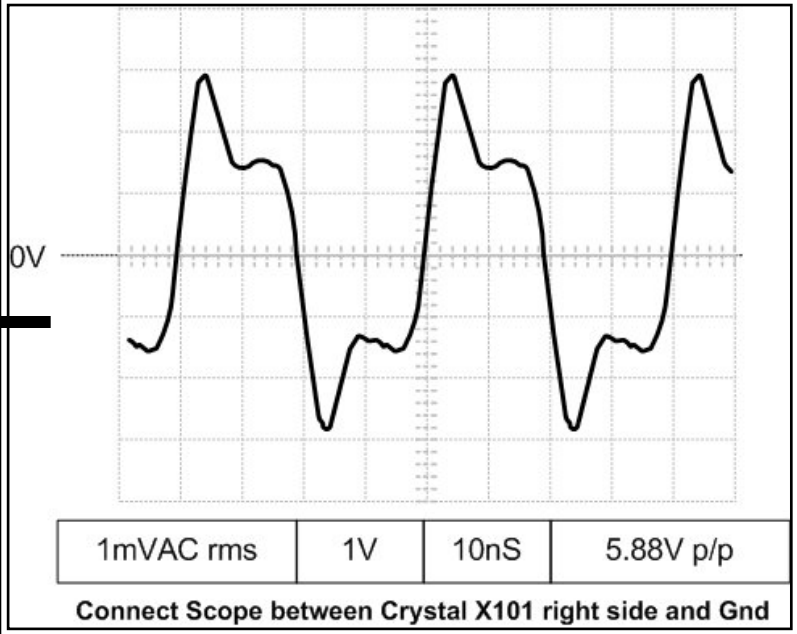
When the Television has a problem related to;
1) Shutdown caused by Main Board.
2) No Video (No Picture) Sound OK.
This can be checked by the following.
(1) Disconnect the Main board from all connectors. Apply AC power.
Since P813 is not connected to the SMPS, the set will come on.
Short the two pins on the Auto Test Pattern lands.
If there is a picture of cycling colors and patters, the Y-SUS, Y-Drive, Z-SUS, Power Supply, Control board, X-Boards, TCPs and Panel are all OK.
Use the same test for problem (2) above to tell if the No Video is caused by the Main board or failed LVDS cable.

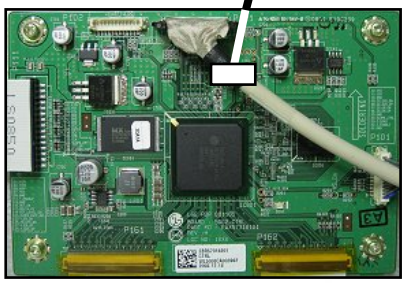
Checking the Crystal X101 "Clock" on the Control Board



DC Voltage Check
1.5V ~ 1.8V

Osc. Check: 25Mhz



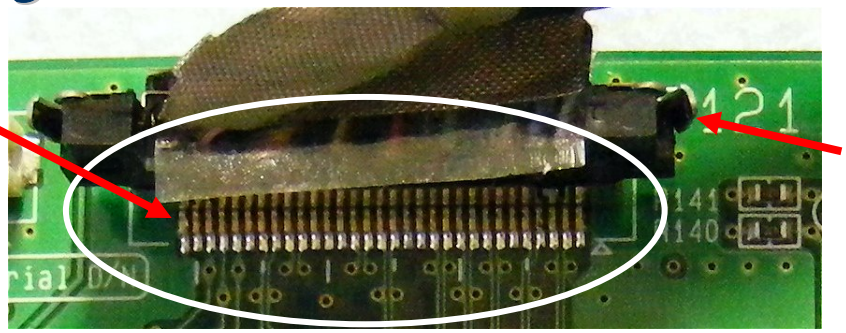


CONTROL BOARD CRYSTAL LOCATION

Check the output of the Oscillator (Crystal). The frequency of the sine wave is 25 MHZ. Missing this clock signal will halt operation of the panel drive signals.

Control Board LVDS Signals

Pins are close together, Use Main board side.

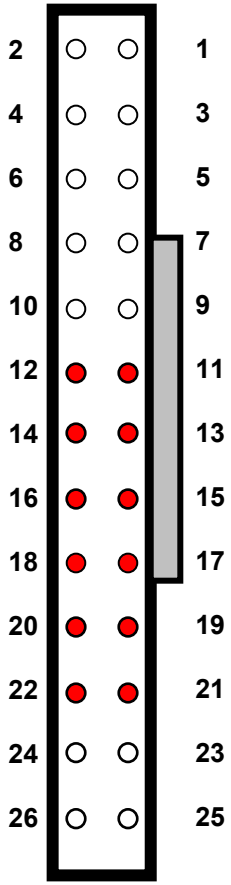


LVDS Cable
P121 on Control board shown.
Press two outside tabs inward to release.

On Main Board

Connector P1002 Configuration

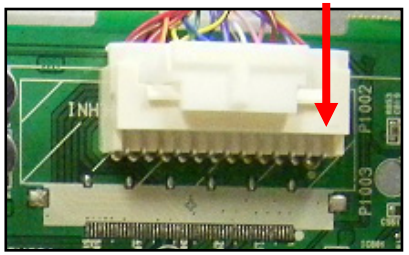
● - indicates signal pins.



LVDS

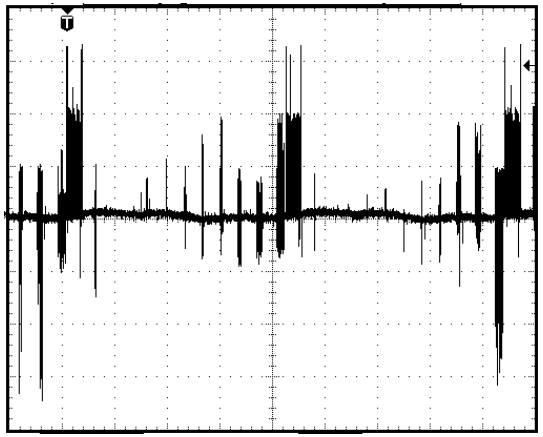
Video Signals from the Main Board to the Control Board are referred to as Low Voltage Differential Signals or LVDS. Their presence can be confirmed with the Oscilloscope by monitoring the LVDS signals with no input signal selected while pressing the Menu Button “on” and “off” with the Remote Control or Keypad. Loss of these Signals would confirm the failure is on the Main Board!

Pin ①

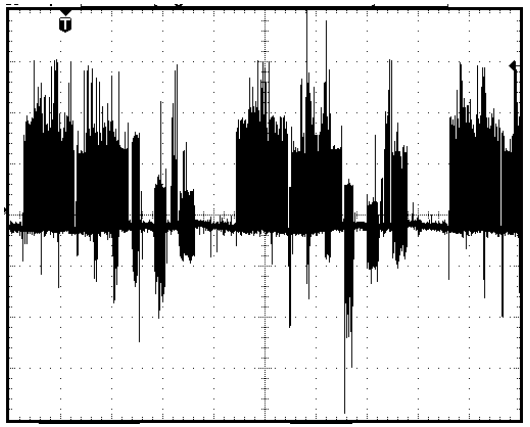


Main board P1002

Menu Off



Menu ON



Example of Normal Signals measured at 200mv/cm at 5μs/cm.

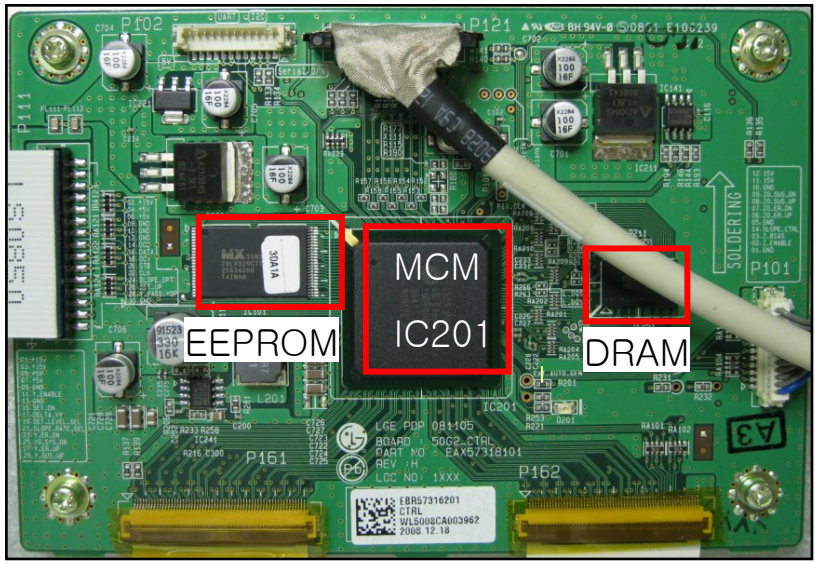
Control Board Signal (Simplified Block Diagram)

The Control Board supplies Video Signals to the TCP (Tape Carrier Package) ICs.

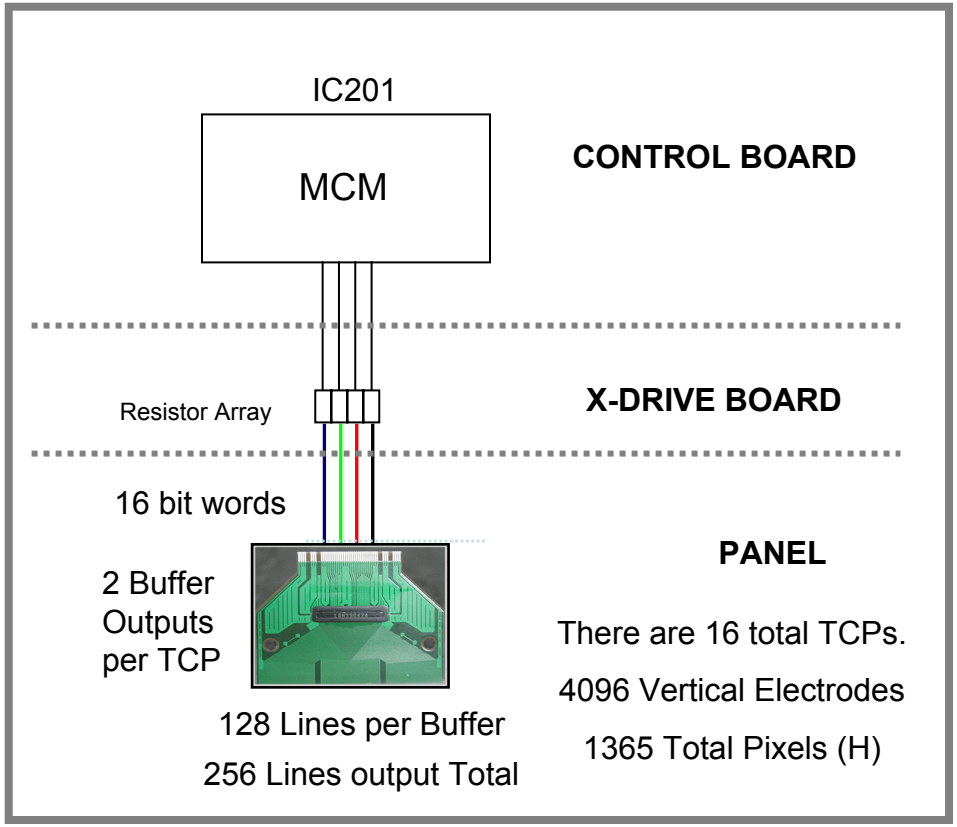
If there is a bar defect on the screen, it could be a Control Board problem.

Control Board to X Board Address Signal Flow

This Picture shows Signal Flow Distribution to help determine the failure depending on where the it shows on the screen.



Basic Diagram of Control Board

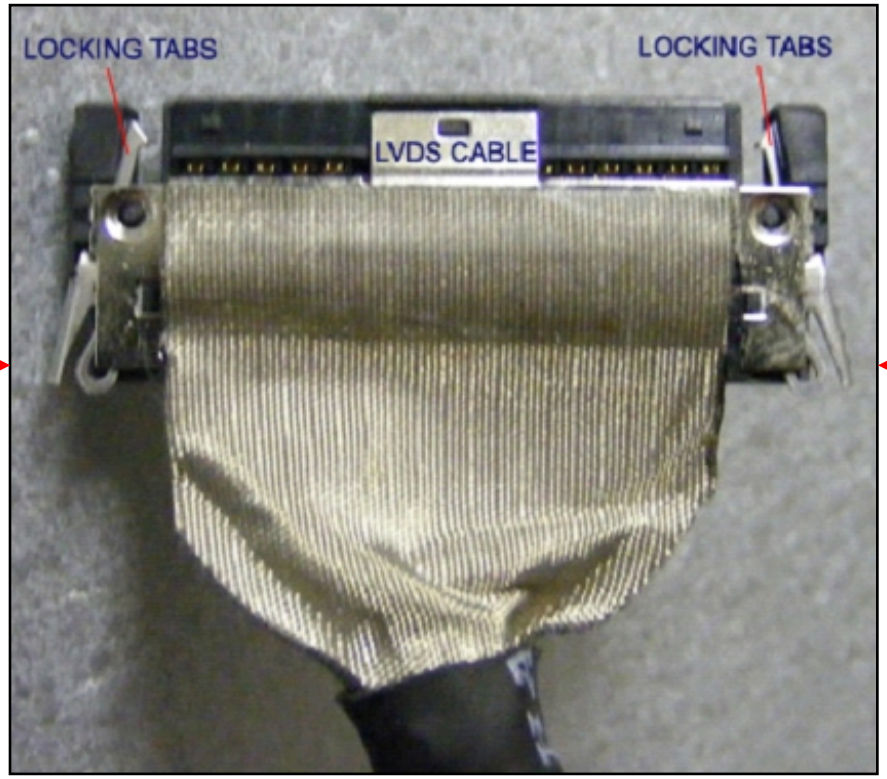


Removing the LVDS Cable from the Control Board

The LVDS Cable has two “Interlocks” that must be disengaged to remove the LVDS Cable.

To Disengage, press the two Locking Tabs Inward and pull the plug out.

Press Inward



Press Inward

Control Board Connector P111 to Y-SUS P101 Voltages and Diode Mode Checks

P111 These pins are very close together. When taking Voltage measurements use Caution.

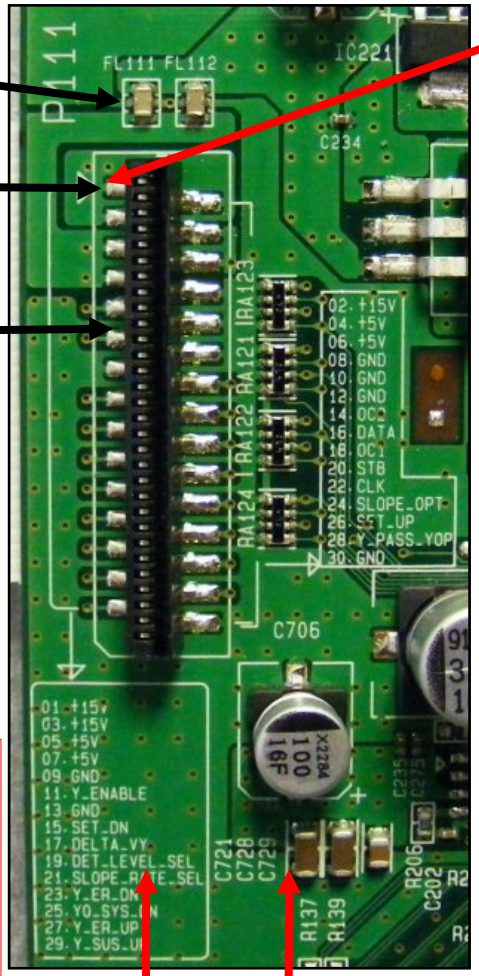
FL111 and FL112 +5V Fuse

Pins 1, and 2
Receive +15V from the Y-SUS.

Pins 3, 4, 5, 6, and 7
Receive +5V from the Y-SUS.

Pins 9, 10, 11 and 30
Are Ground

All the rest are delivering Y-SUS Waveform development and Y-Drive logic signals to the Y-SUS Board (Y-Drive logic signals are simply routed right through the Y-SUS to the Y-Drive boards).

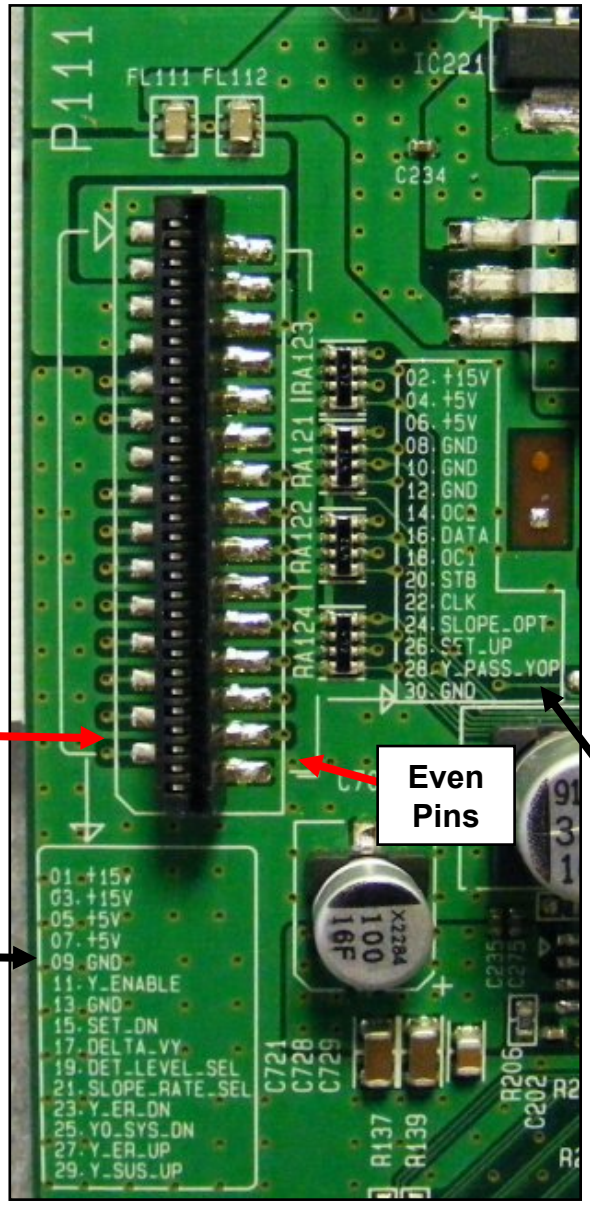


The +17V is not used by the Control board, it is routed to the Z-SUS leaving on P101 Pins 11 and 12.

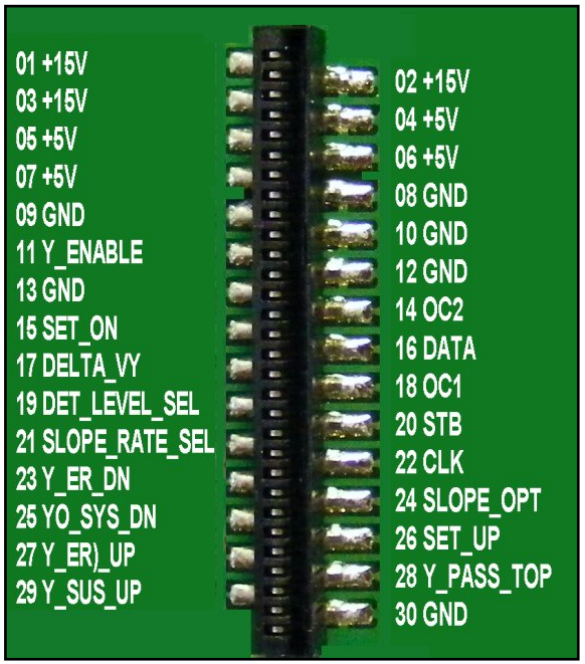
Tip: For Checking Voltages, Check the Odd pins on the Control board and the Even pins on the Y-SUS board.

Control Board Connector P111 Silkscreen Can Be Misleading

P111 The silkscreen indicates that taking voltage or signal readings on P111 show Odd pins on the Left and Even pins on the Right.



P111 Example:
If there were room for Labeling



Odd Pins

Even Pins

Silkscreen Label:
The pin numbers are correct. Remember Odd pins on the left and even pins are on the right.

Silkscreen Label:
The pin numbers are correct. Remember Odd pins on the left and even pins are on the right.

Control P111 to Y-SUS P101 Plug Information

Tip: For Checking Voltages, Check the Odd pins on the Control board and the Even pins on the Y-SUS board.

P111 CONNECTOR "Control Board" to "Y-SUS" P101

Pin	Label	Run	Diode Mode
01	+15V	17.04V	Open
03	+15V	17.04V	Open
05	+5V	5V	0.97V
07	+5V	5V	0.97V
09	GND	0.1V	Open
11	Y_ENABLE	0V	1.76V
13	GND	Gnd	Gnd
15	SET_ON	1.99V	Open
17	DELTA_VY	0.57V	Open
19	DET_LEVEL_SEL	1.29V	Open
21	SLOPE_RATE_SEL	0.17V	Open
23	Y_ER_DN	0.114V	Open
25	YO_SYS_DN	2.6V	Open
27	Y_ER)_UP	0.14V	Open
29	Y_SUS_UP	0.11V	Open

Pin	Label	Run	Diode Mode
02	+15V	17.04V	Open
04	+5V	4.95V	0.97V
06	+5V	4.95V	0.97V
08	GND	Gnd	Gnd
10	GND	Gnd	Gnd
12	GND	Gnd	Gnd
14	OC2	1.82V	Open
16	DATA	0V	Open
18	OC1	1.44V	Open
20	STB	1.45V	Open
22	CLK	0.6V	Open
24	SLOPE_OPT	024V	Open
26	SET_UP	3.12V	Open
28	Y_PASS_TOP	1.1V	Open
30	GND	Gnd	Gnd

There are no Stand-By voltages on this connector

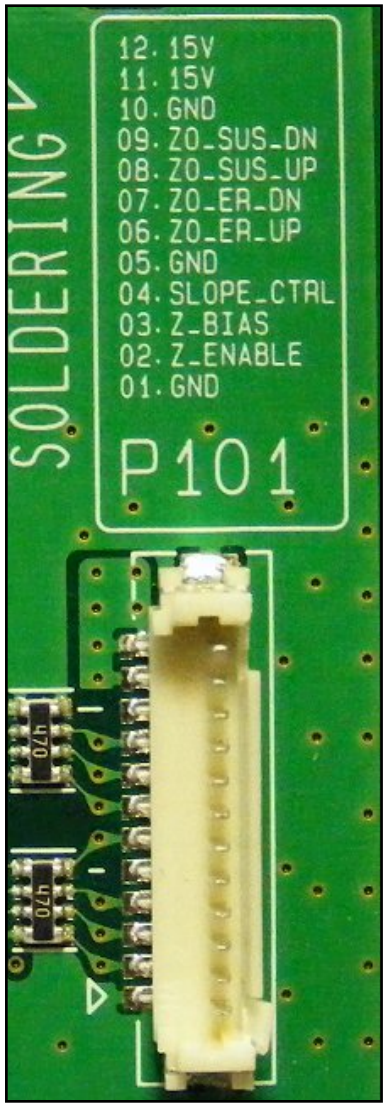
Diode Mode Readings taken with all connectors Disconnected. DVM in Diode Mode.

Control Board P101 to Z-SUS P100 Plug Information

Diode Mode Readings taken with all connectors Disconnected. DVM in Diode Mode.

P101 CONNECTOR "Control Board" to "Z-SUS" P100

Pin	Label	Run	Diode Mode
1	Gnd	Gnd	Gnd
2	Z_ENABLE	0.05V	Open
3	Z_Bias	1.8V	Open
4	SLOPE_CTRL	1.7V	Open
5	Gnd	Gnd	Gnd
6	ZO_ER_Up	0.3V	Open
7	ZO_ER_Dn	0.4V	Open
8	ZO_SUS_Up	0.2V	Open
9	ZO_SUS_Dn	0.8V	Open
10	Gnd	Gnd	Gnd
11	15V	17V	Open
12	15V	17V	Open

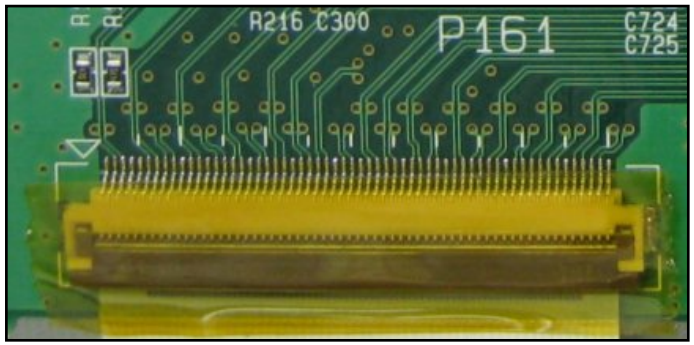


Pin 1 at the bottom of the connector

Control Board Connector P161 and P162 to X-Drive Boards

P161 and P162 Connectors from the "Control Board" to "X Drive Center".

These pins may be covered with tape for transportation issues. (Tape can be removed).

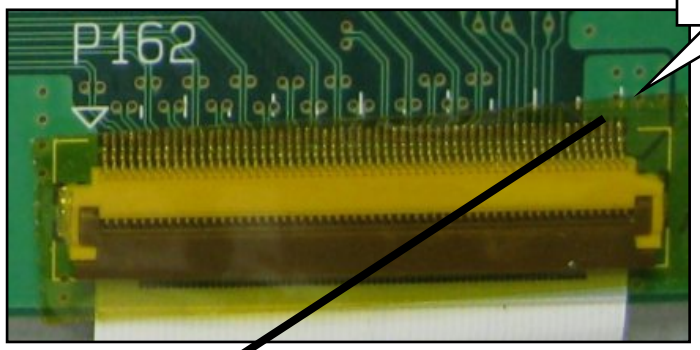


P161

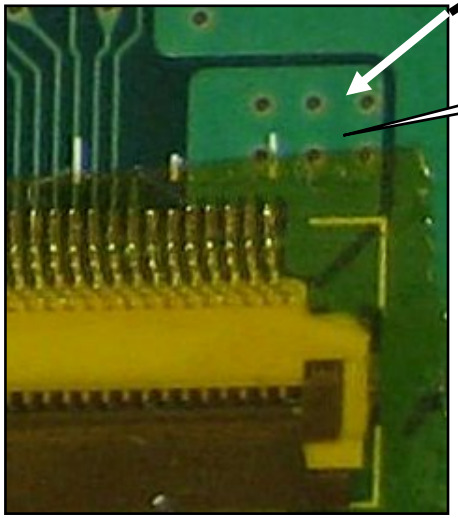
Tape removed

P162

3.3V TP



Delivers only RGB drive signals



3.3V TP

Delivers only RGB drive signals and 3.3V

3.3V created by IC221

Note: In this set, both connectors go to the Center X-Board

The rest of the pins are much too close together for a safe test.

X BOARDS SECTION

X Board Left, Center and Right (Commonly known as A-BUS)

The X Drive Boards deliver the Color drive signals to the Vertical Grids via TCPs.
The 50PQ30 has a Left, Center and a Right X-Drive board.
The Center X-Board has 6 connectors to a TCPs.
The Left and Right have 5 connections to TCPs.
Each TCP has 2 internal buffers.
Each buffer controls 128 vertical grids lines (256 per/TCP).

Generally speaking, there isn't many active components on the X-Drive Boards. So they are not very prone to failure.

In this section the X-Drive will be discussed and information given allowing the service technician to determine if a failure has occurred in the X-Drive section.

X-BOARDS CONTROL THE VERTICAL ELECTRODES WHICH DETERMINE THE HORIZONTAL PIXEL COUNT. TOTAL VERTICAL ELECTRODES 4096. TOTAL HORIZONTAL PIXELS 1365.

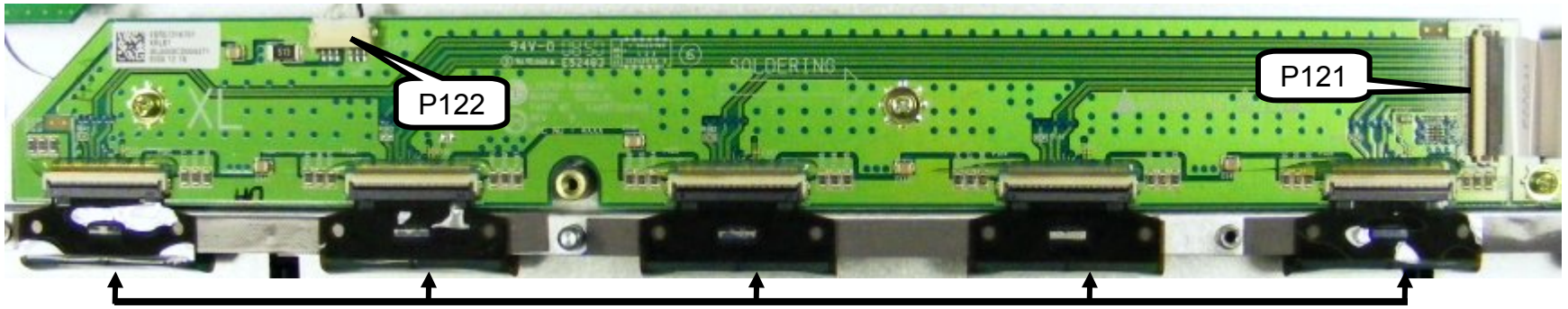
Total Buffer Count = 36
(TCPs = 16 @ 2 buffers per/TCP)

Total Output Pins = 4096
(128 per buffer X 36 total)

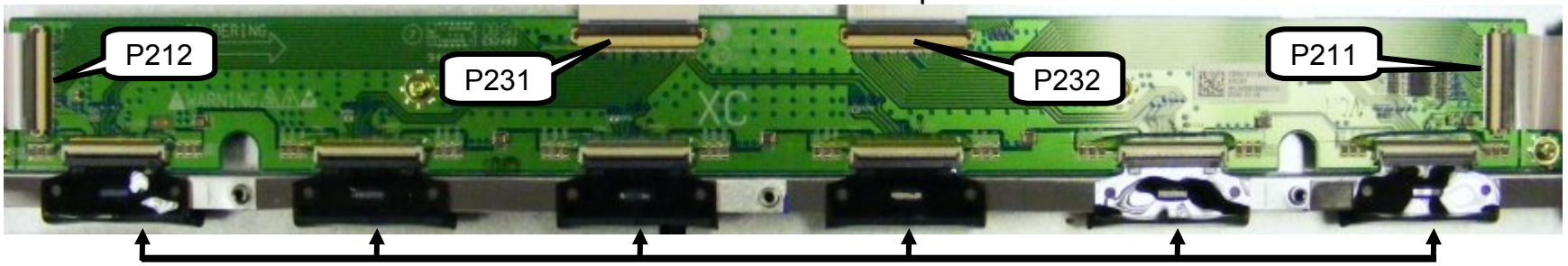
Total Pixels (Horizontal) 1365
(4096 / 3) Three cells per pixel (Red, Green and Blue)

Left, Center and Right X Boards (Commonly known as A-BUS)

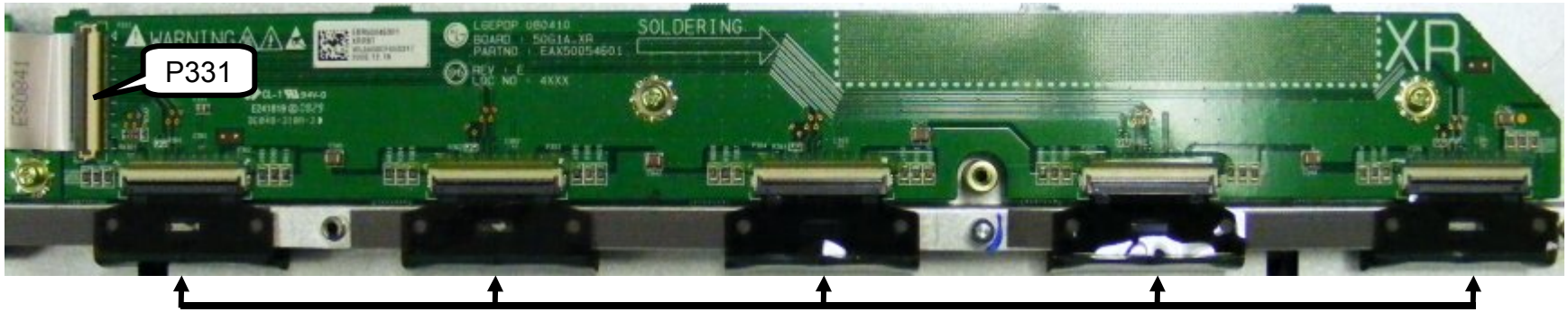
Warning: DO NOT attempt to run the set with the Heat Sink over the TCPs removed.
After a very short time, these ICs will begin to self destruct due to overheating.



LEFT X BOARD TCP IC's shown are part of the Ribbon Cable



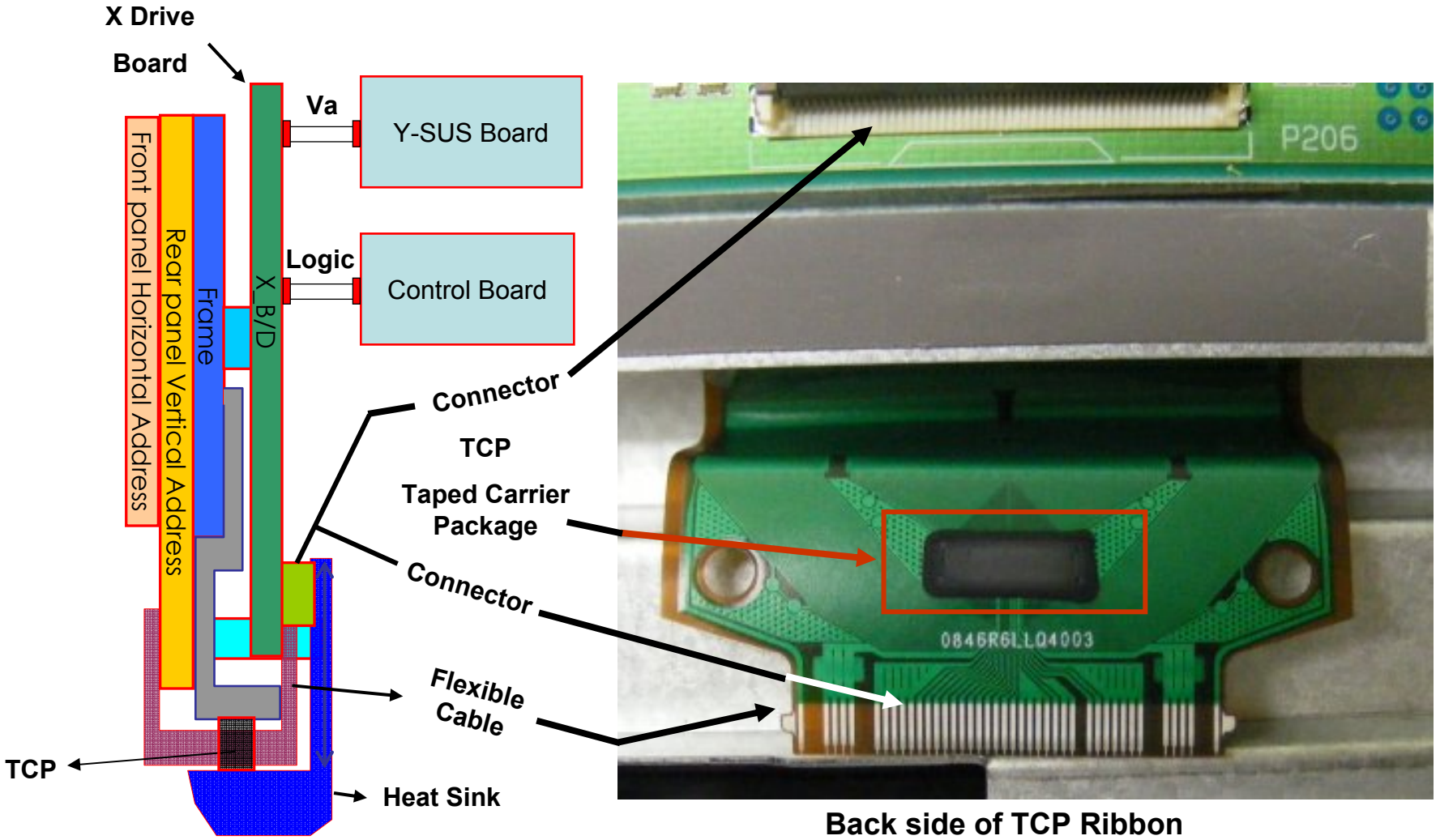
CENTER X BOARD TCP IC's shown are part of the Ribbon Cable



RIGHT X BOARD TCP IC's shown are part of the Ribbon Cable

TCP (Tape Carrier Package)

TCP ICs receive RGB 16 bit signal and deliver it to the PDP by connecting the PAD Electrode of the PANEL with the X Board.



Back side of TCP Ribbon

TCP Testing

(+) On any Gnd

10,11,12,13,14,27,28,29,30,37,38,39,40,41

(-) On any Va

4,5,6,7,44,45,46,47

On 3.3V

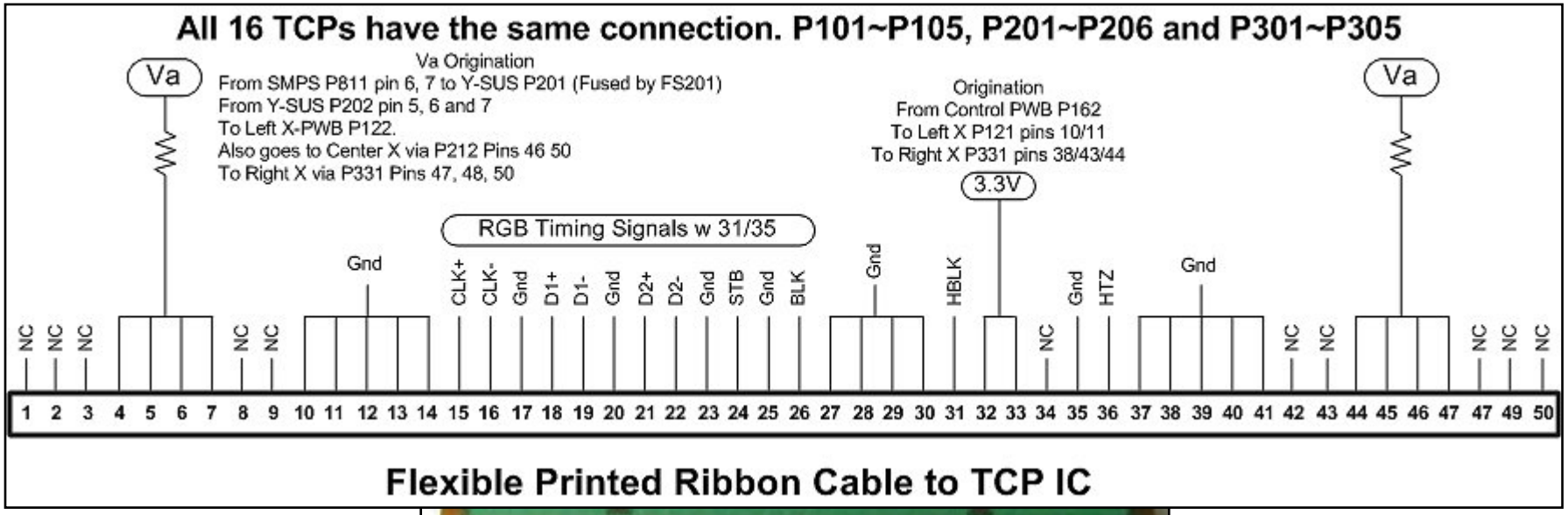
32 or 33

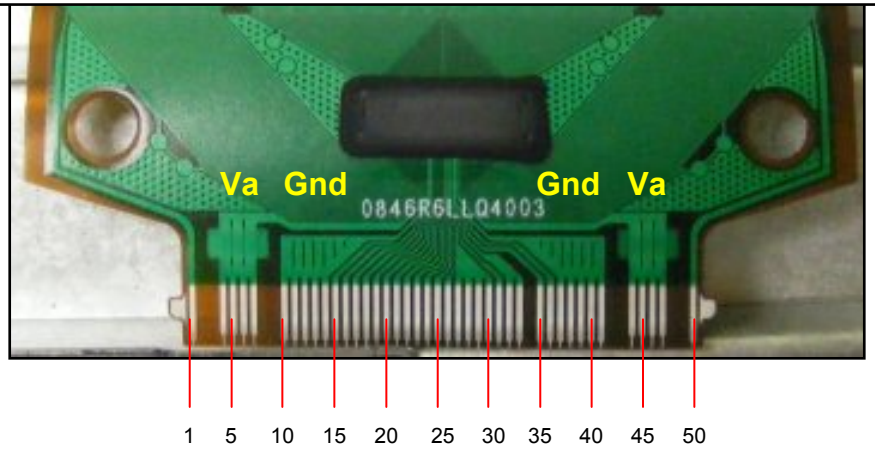
On any signal

15,16,18,19,21, 22,24,26,31,36

Typical Reading 0.56~0.65V
Forward biased

Reverse Leads Reads Open
Reversed biased

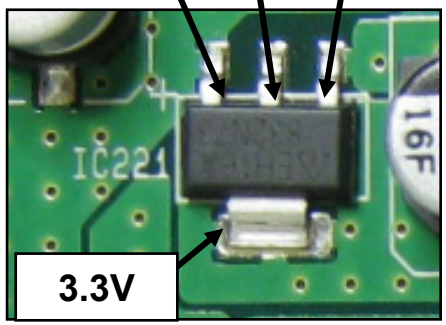




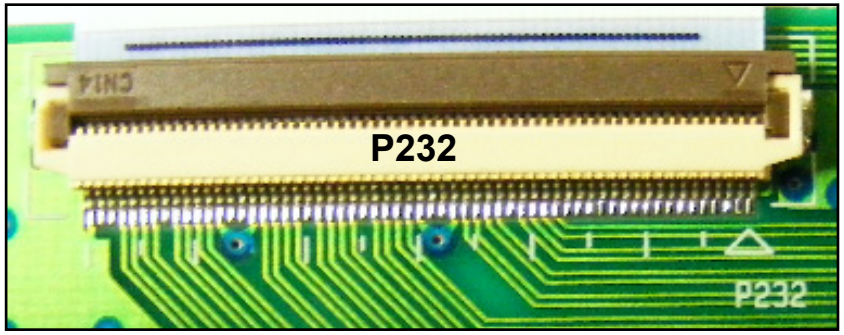
Look for any TCPs being discolored.
Ribbon Damage. Cracks, folds Pinches, scratches, etc…

TCP 3.3V B+ Check

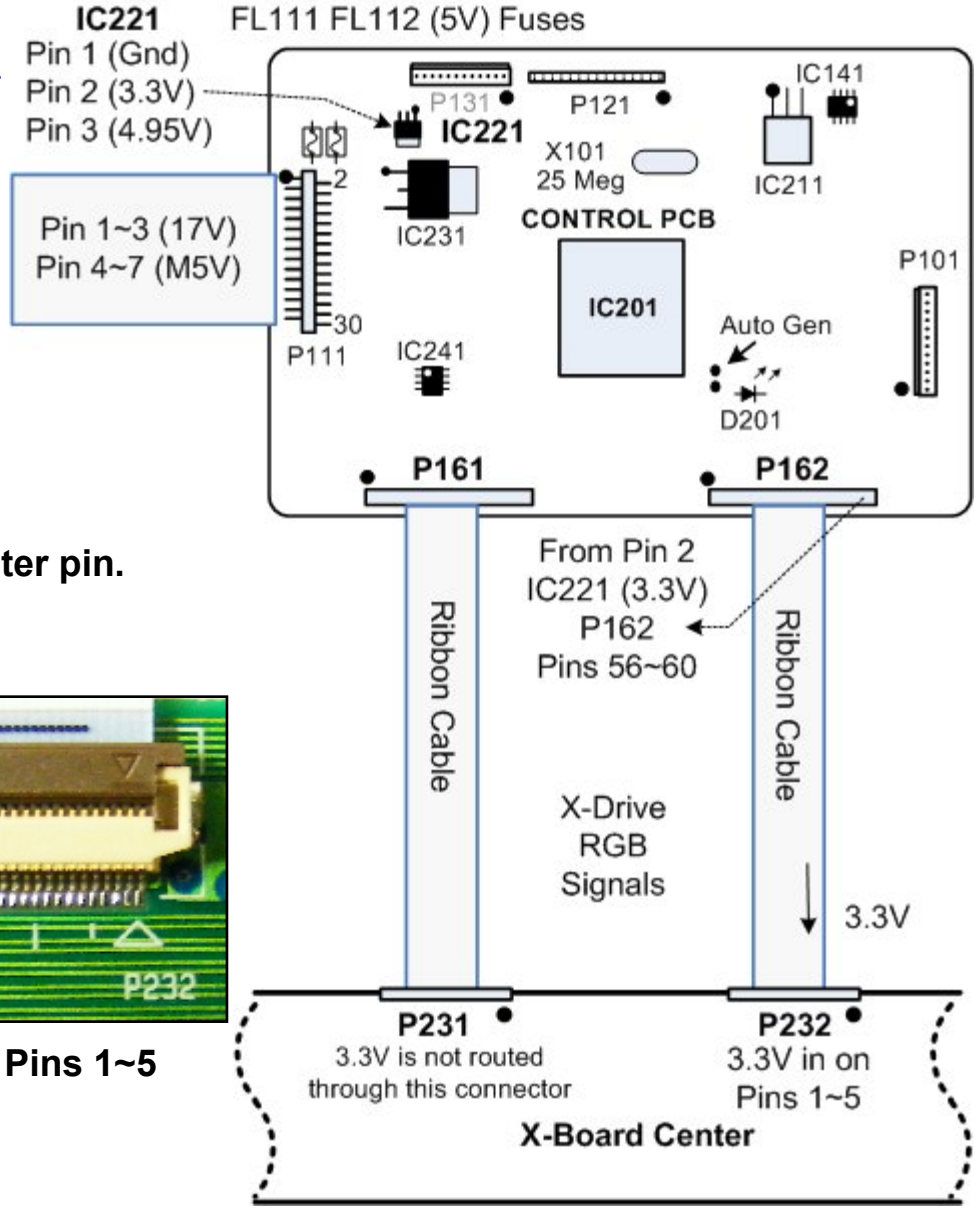
Warning: DO NOT attempt to run the set with the Heat Sink over the TCPs removed.



Checking IC221 for 3.3V use center pin.



3.3V in on Pins 1~5



TCP Visual Observation. Damaged TCP

Warning: DO NOT attempt to run the set with the Heat Sink over the TCPs removed. After a very short time, these ICs will begin to self destruct due to overheating.

This damaged TCP can,

a) Cause the Power Supply to shutdown
b) Generate abnormal vertical bars
c) Cause the entire area driven by the TCP to be “All White”
d) Cause the entire area driven by the TCP to be “All Black”
e) Cause a “Single Line” defect

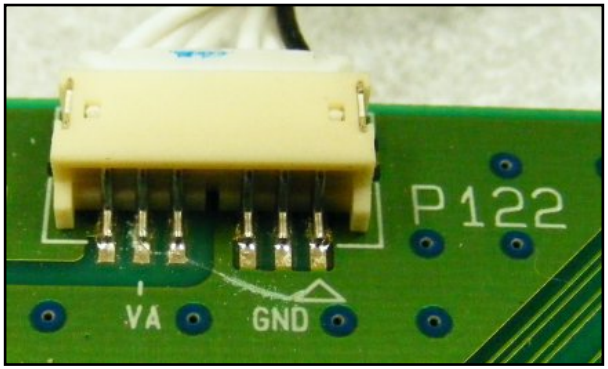


X Drive Left Connector P122 Voltages and Diode Check

Voltage and Diode Mode Measurements for the Left X Drive Board

P122 CONNECTOR "X Drive Left" to "Y-SUS" P202

Pin	Label	Run	Diode Mode
1	Gnd	Gnd	Gnd
2	Gnd	Gnd	Gnd
3	Gnd	Gnd	Gnd
4	n/c	n/a	n/a
5	VA	*60V	Open
6	VA	*60V	Open
7	VA	*60V	Open



*** Note: This voltage will vary in accordance with Panel Label**

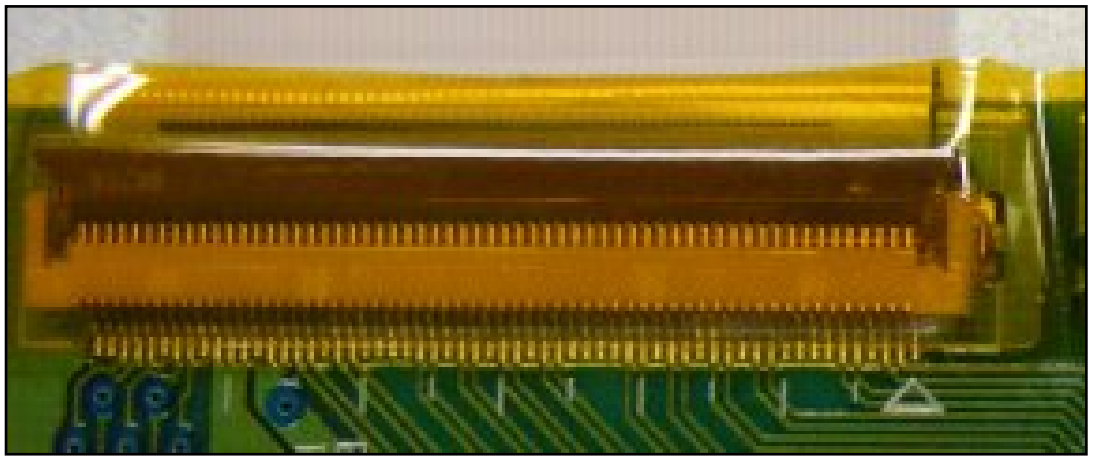
Diode Mode Readings taken with all connectors Disconnected. DVM in Diode Mode.

X Drive Left and Right Connector P232 and P331

Voltage and Diode Mode Measurements for the X Drive Board

Voltage and Diode Mode Measurements for these connectors are difficult to read. They are too close together for safe test.

The pins are also protected by a layer of tape to prevent the tab from being released causing separation from the Cable and the connector.



MAIN BOARD SECTION

This Section of the Presentation will cover troubleshooting the Main Board. Upon completion of this Section the technician will have a better understanding of the operation of the circuit and will be able to locate voltage and diode mode test points needed for troubleshooting and for all alignments.

- DC Voltage and Waveform Checks
- Diode Mode Measurements

Operating Voltages

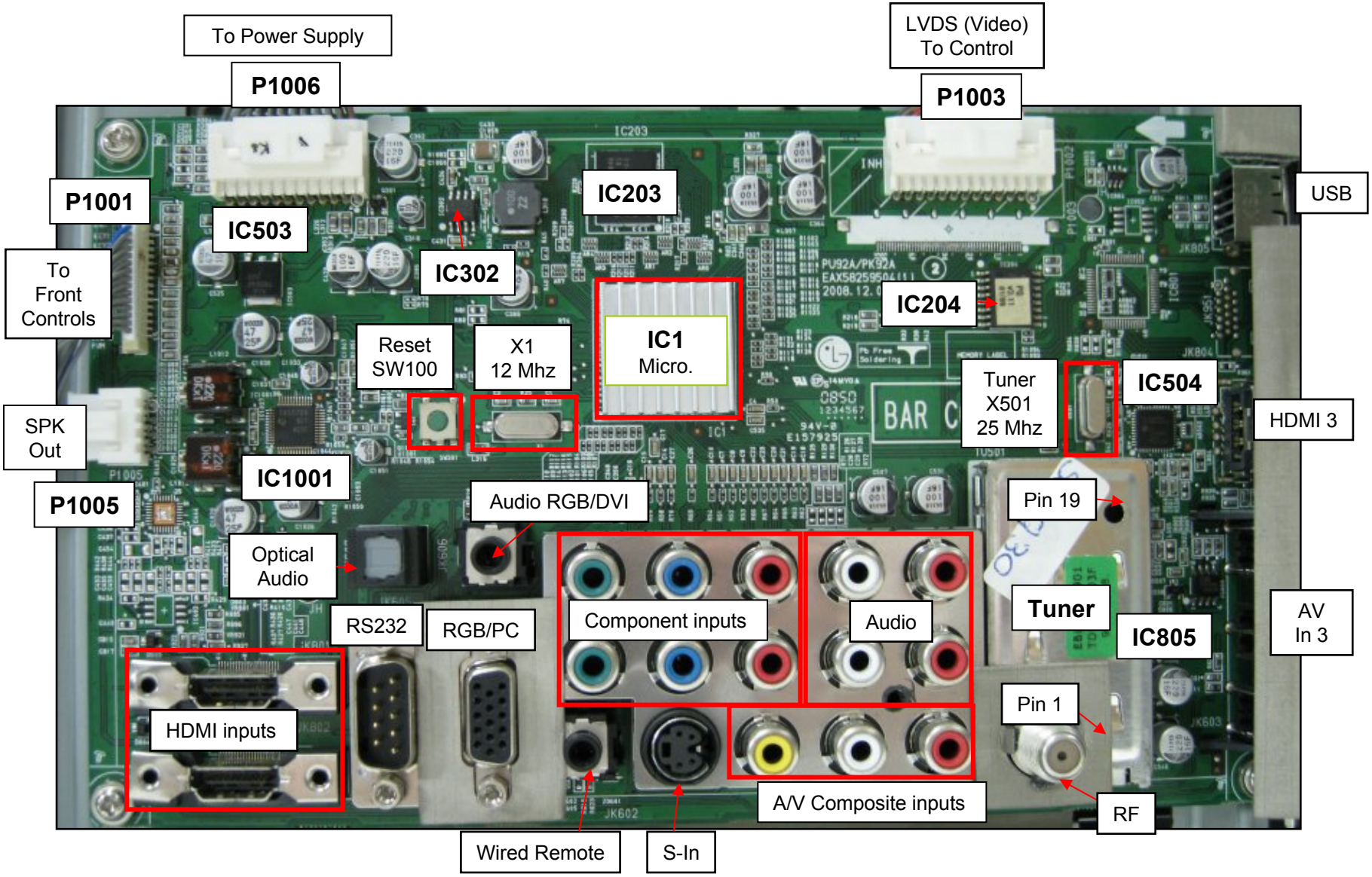
SMPS Supplied

5V Stand-By
5V
12V (Tuner B+)
16V (Audio B+)

Developed on the Main Board

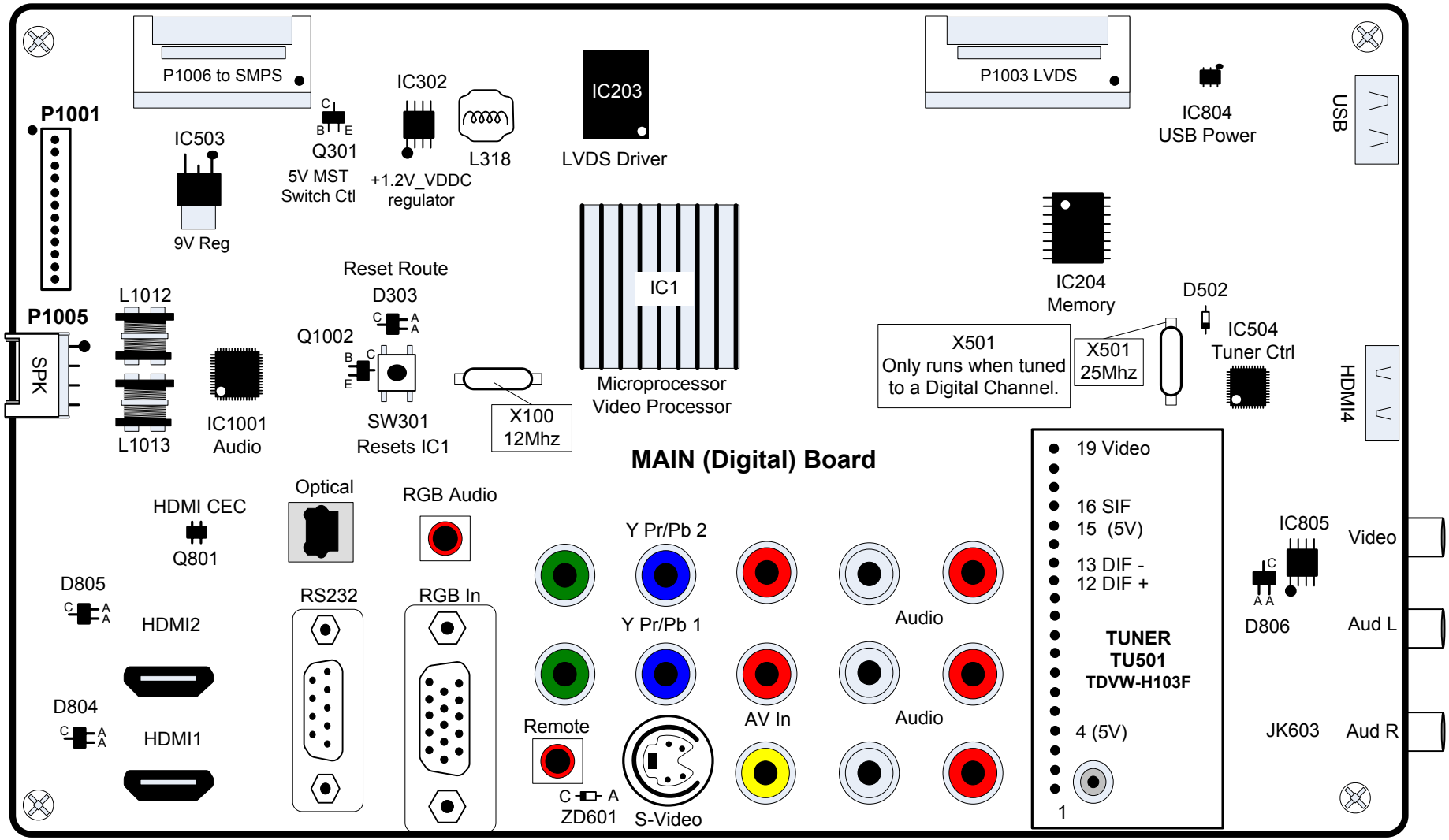
5V (MST)
3.3V (MST)
3.3V (PVSB)
1.8V (MST)
1.2V (VDDC)
9V (TU)
3.3V (VST)
3.3V (DVDD)
2.5V
1.2V (PVSB)
5V (TU)

Main Board Layout and Identification



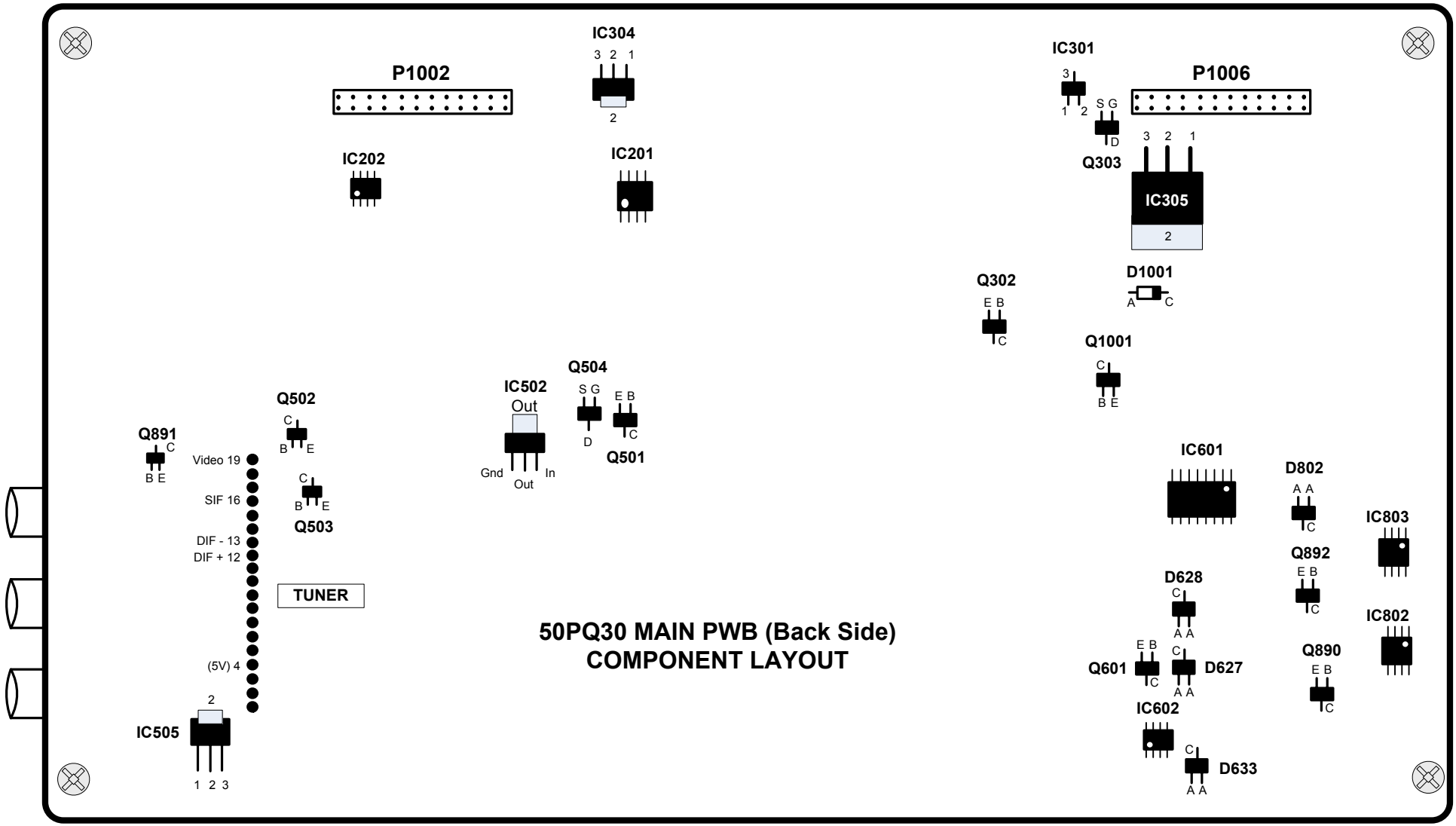
50PQ30 MAIN PWB (Front Side) COMPONENT LAYOUT

For component voltages, see the 50PQ30 Interconnect Section page 3.

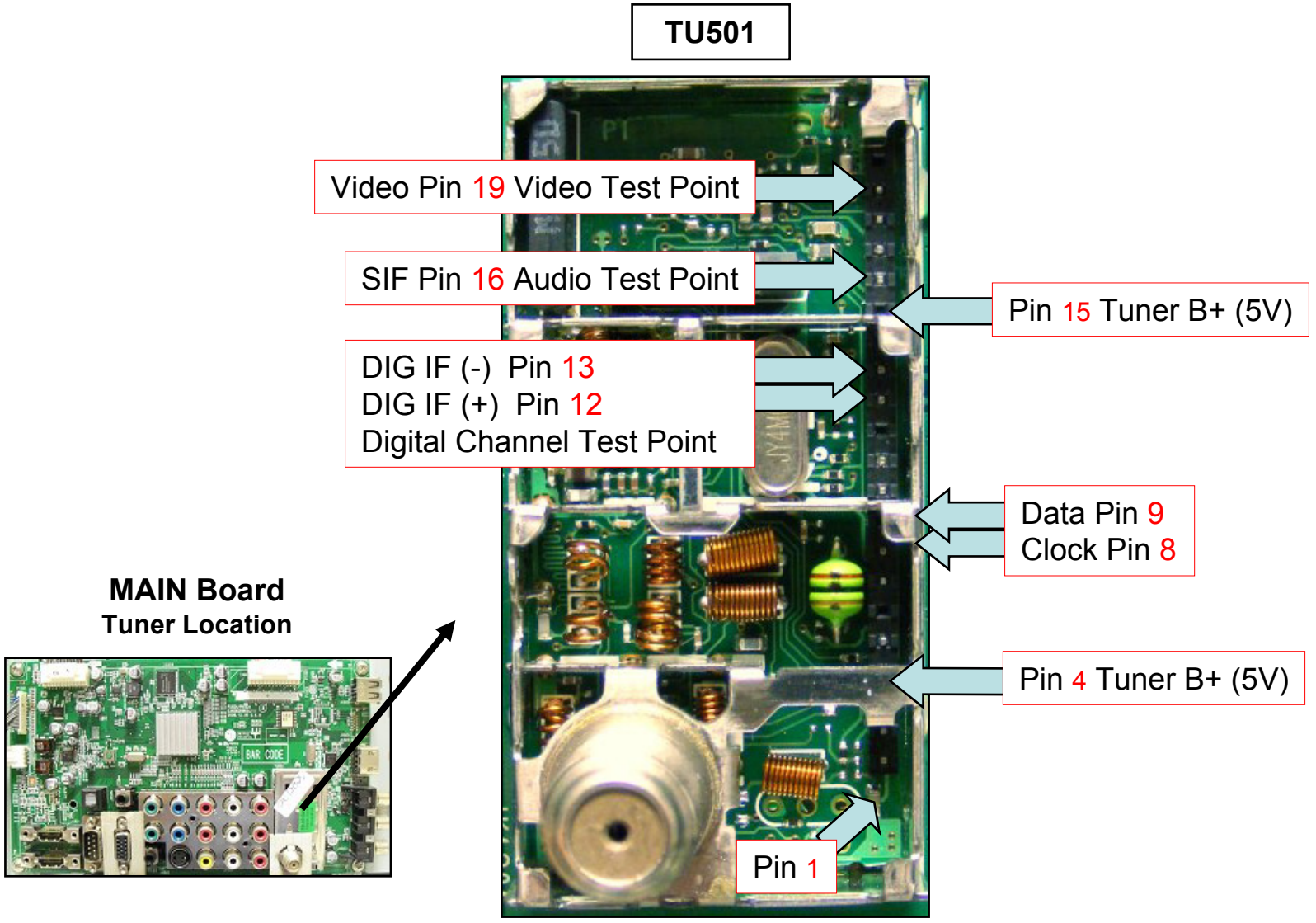


50PQ30 MAIN PWB (Back Side) COMPONENT LAYOUT

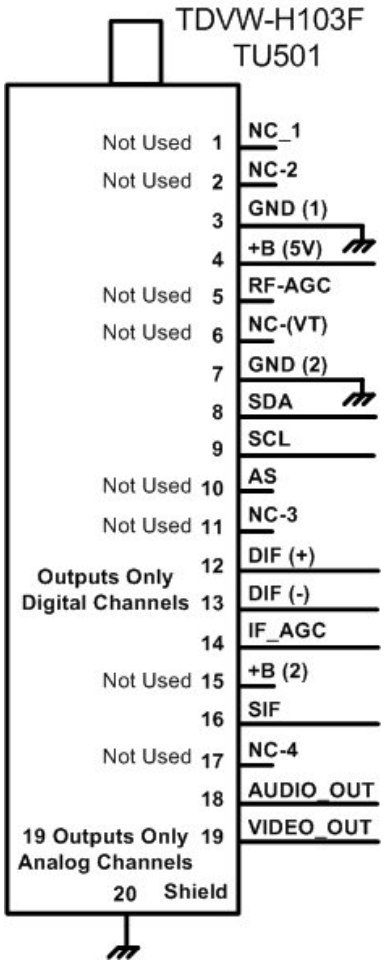
For component voltages, see the 50PQ30 Interconnect Section page 3.



Main Board Tuner Check (Shield Off, Pins Exposed)

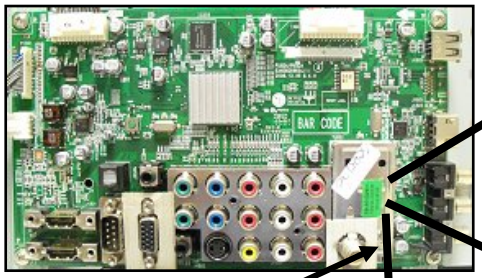


Main Board Tuner Video and SIF Output Check



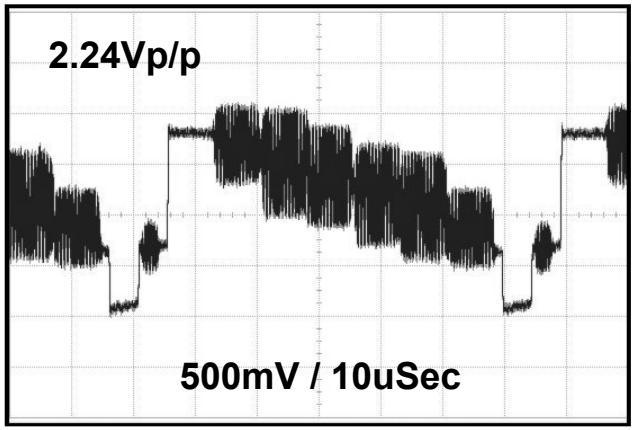
USING COLOR BAR SIGNAL INPUT

MAIN Board
Tuner Location

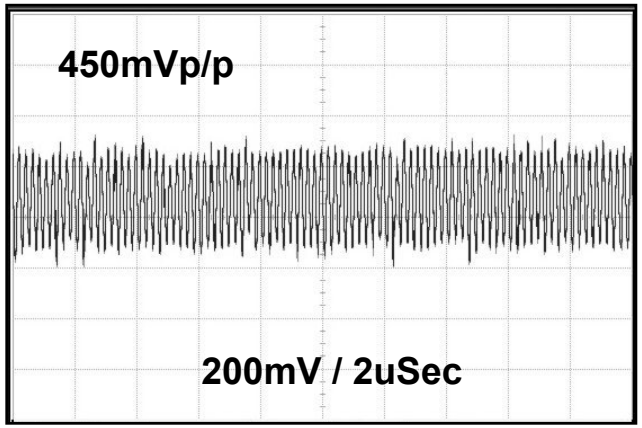


Pin 1

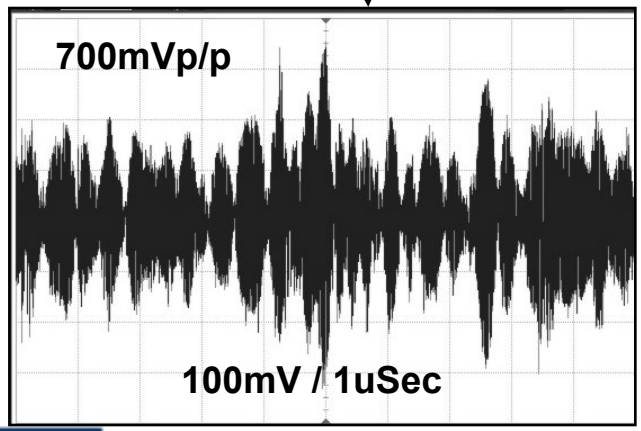
Pin 19 "Video" Signal



Pin 16 "SIF" Signal



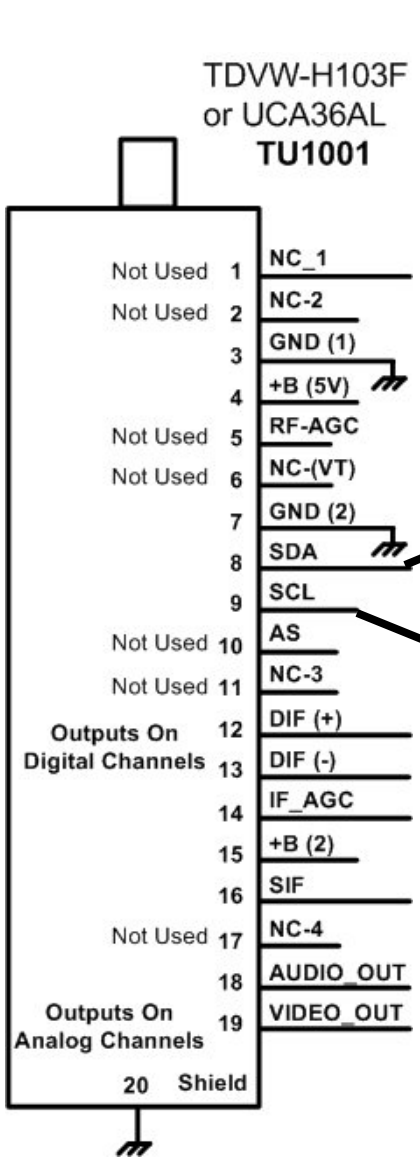
Pin 12 and Pin 13 "Dig IF" Signal



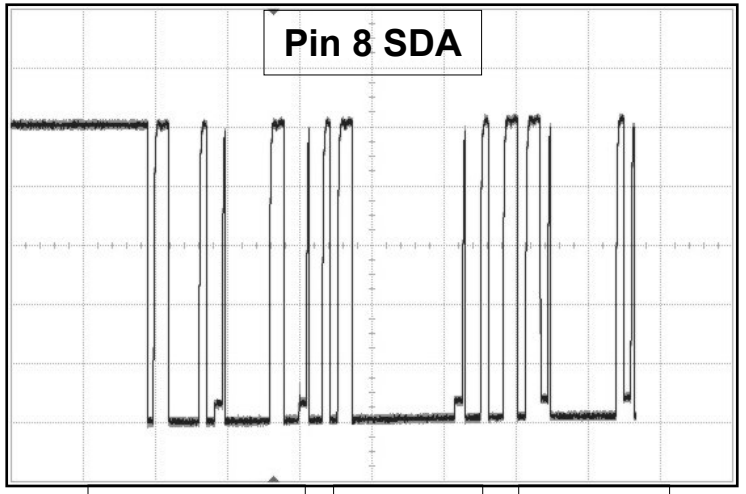
Note:
"Video Out" Signal only when receiving an analog Channel.

Note:
"Dig IF" Signal only when receiving a Digital Channel.

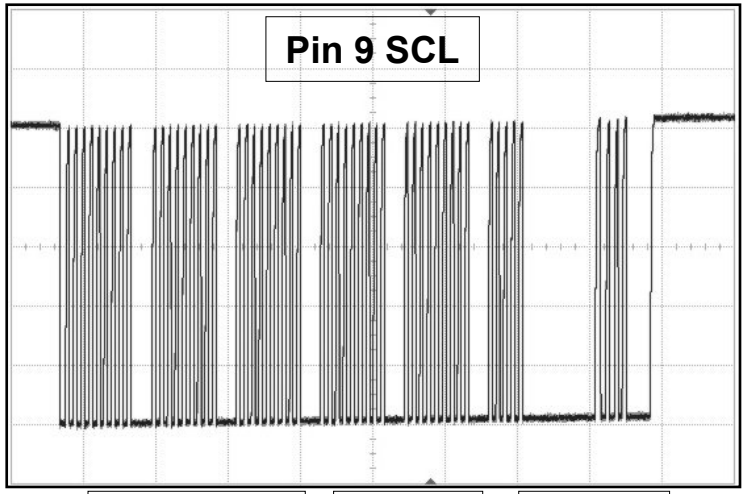
Main PWB Tuner Clock and Data Lines



Note:
SCL and SDA only active during an actual Channel Change.

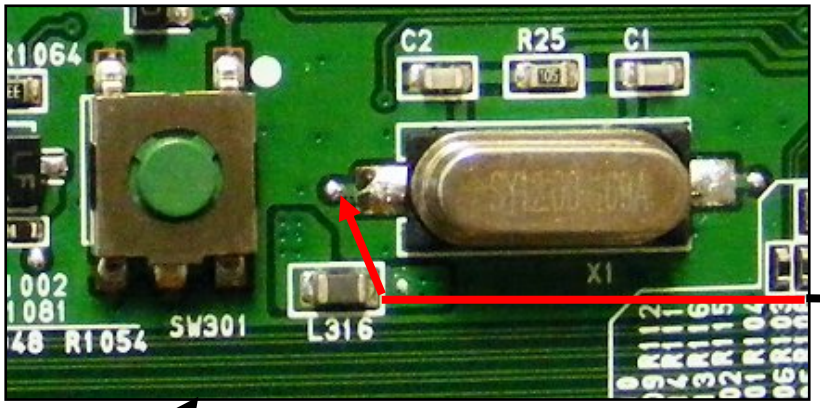


1V per/div **100uS** **5V p/p**



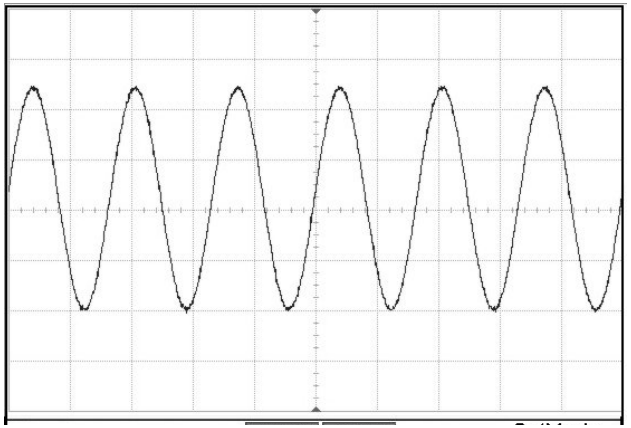
1V per/div **100uS** **5V p/p**

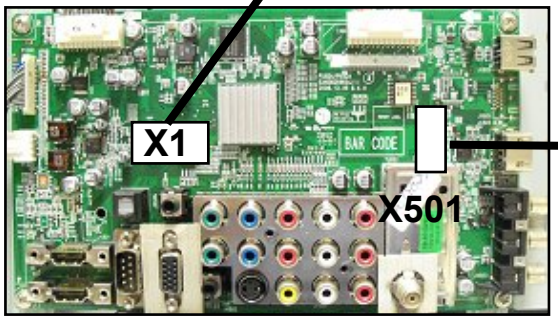
Main Board Crystal X1 and X501 Check



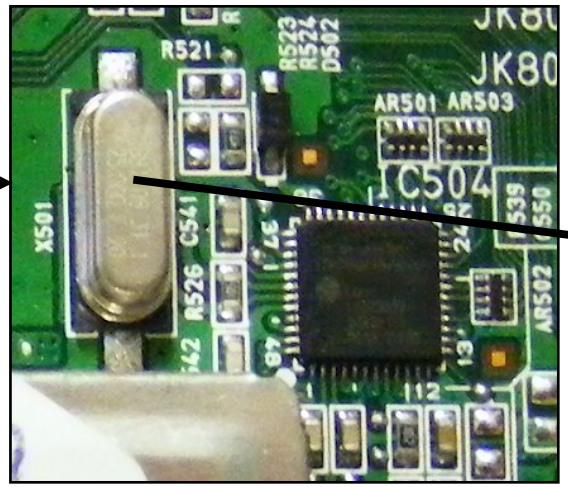
Runs all the time

Left Side (1.576V DC) / (2.5V p/p)
Right Side (1.6V DC) / (3V p/p)
12Mhz



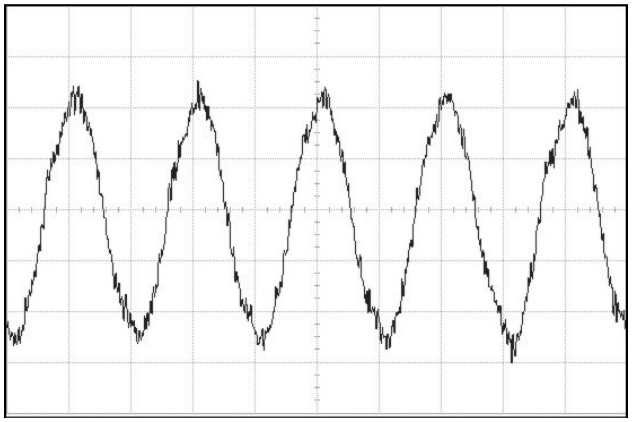


MAIN Board
Crystal
Location



Runs only on Digital Channels

Top (1.49V DC)/(3.84V p/p)
Bottom (1.58V DC)/(5.27V p/p)
25Mhz



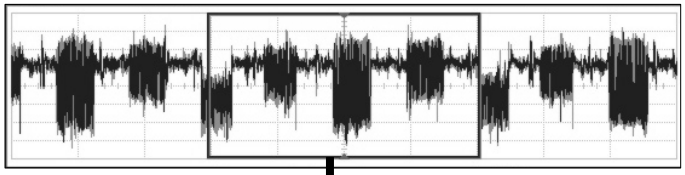
Main Board P1002 LVDS Video Signal Check

Using a SMPTE Color Bar Signal

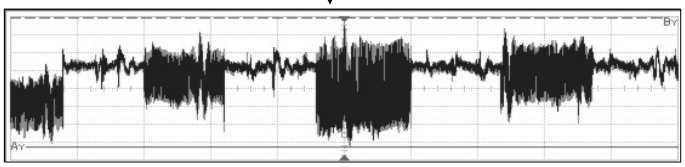
See Interconnect Diagram (Page 2) for all LVDS cable video signal Waveforms.

P1003 LVDS (Pin 11) 5uSec / 718mV

Pin 11
5uSec per/Div



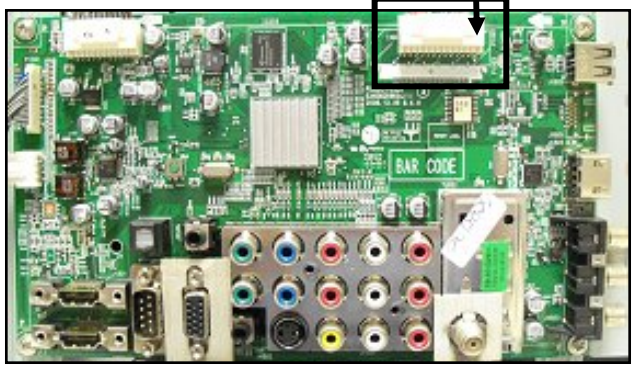
Pin 11
2uSec per/Div



P1003 LVDS (Pin 11) 2uSec / 718mV

P1003 Location

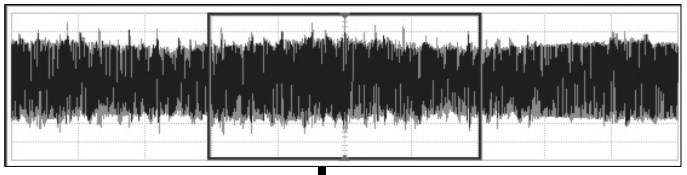
Pin 1



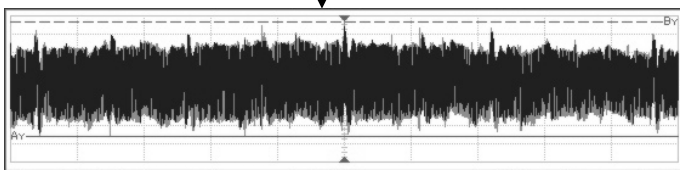
MAIN BOARD

P1003 LVDS (Pin 11) 5uSec / 642mV

Pin 18
5uSec per/Div



Pin 18
2uSec per/Div

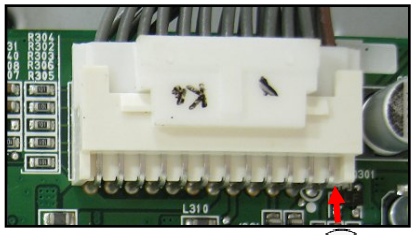


P1003 LVDS (Pin 11) 2uSec / 642mV

700mVp/p

Main Board Plug P1006 to Power Supply Voltages and Diode Check

P1006



Pin (1) front

Voltage and Diode Mode Measurements

Diode Mode Readings with all Connectors Disconnected. DVM in the Diode mode.

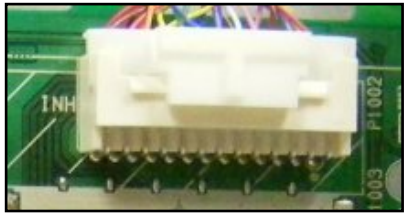
P301 CONNECTOR "Main" to “Power Supply" P813

Pin	Label	STBY	Run	Diode Mode
1	17V	0V	17.3V	Open
3	Gnd	Gnd	Gnd	Gnd
5	12V	0V	12V	Open
7	Gnd	Gnd	Gnd	Gnd
9	5V	5V	5V	1.1V
11	5V	5V	5V	1.1V
13	Gnd	Gnd	Gnd	Gnd
15	Gnd	Gnd	Gnd	Gnd
17	5V Det	0V	4.6V	Open
19	RL On	0V	3.3V	Open
21	M5 ON	0V	3.3V	Open
23	Stby 5V	5V	5V	1.36V

Pin	Label	STBY	Run	Diode Mode
2	17V	0V	17.3V	Open
4	Gnd	Gnd	Gnd	Gnd
6	12V	0V	12V	Open
8	Gnd	Gnd	Gnd	Gnd
10	5V	5V	5V	1.1V
12	STBY5V	5V	5V	1.1V
14	Gnd	Gnd	Gnd	Gnd
16	Gnd	Gnd	Gnd	Gnd
18	AC Det	4.6V	4.5V	Open
20	VS On	0V	3.3V	Open
22	Auto Gnd	Gnd	Gnd	Gnd
24	*Key On	0V	0V	Open

***Note: If the Key On line is 5V, the Main Power Switch is open. Stand-By 5V will shut off.**

Main Board Plug P1003 "LVDS" Voltage and Diode Check



Pin ①

P1003 CONNECTOR "Main" to P121 "Control"

Pin	Label	Run	Diode Mode
1	n/c	n/c	n/c
3	ROM_RX1	3.3V	Open
5	Gnd	Gnd	Gnd
7	Gnd	Gnd	Gnd
9	Module_SCL1	3.3V	Open
11	RE2+	1.3V	0.78V
13	RD2+	1.3V	0.96V
15	RCCLK2+	1.3V	0.78V
17	RC2+	1.3V	0.88V
19	RB2+	1.27V	0.78V
21	RA2+	1.37V	0.98V
23	PC_SER_CLK	0V	1.02V
25	DISP_EN	2.82V	0.495V

Pin	Label	Run	Diode Mode
2	n/c	n/c	n/c
4	ROM_TX1	3.29V	Open
6	Gnd	Gnd	Gnd
8	Gnd	Gnd	Gnd
10	Module_SDA1	3.29V	0.889V
12	RE2-	1.23V	0.85V
14	RD2-	1.21V	0.847V
16	RCCLK2-	1.24V	0.78V
18	RC2-	1.26V	0.849V
20	RB2-	1.21V	0.78V
22	RA2-	1.12V	0.869V
24	PC_SER_DATA	3.29V	1.37V
26	Gnd	Gnd	Gnd

This line is held low if the Main board has no power. Auto Gen on Control board will not work unless LVDS cable is removed.

Diode Mode Readings with all Connectors Disconnected. DVM in the Diode mode.

Main Board Plug P1001 to Ft IR Voltages and Diode Checks

Voltage and Diode Mode Measurements for the Main Board



P1001 CONNECTOR "MAIN Board" to "Front IR“ J1

Pin	Label	STBY	Run	Diode Mode
1	IR	5V	5V	Open
2	Gnd	Gnd	Gnd	Gnd
3	Key1	0V	3.3V	1.9V
4	Key2	0V	3.3V	1.9V
5	P Key	0V *(5V)	0V	Open
6	Gnd	Gnd	Gnd	Gnd
7	EYE-SCL	0V	3.3V	Open
8	EYE-SDA	0V	3.3V	Open
9	Gnd	Gnd	Gnd	Gnd
10	5VST	5V	5V	1.3V
11	3.3VST	0V	5.13V	0.629V
12	Gnd	Gnd	Gnd	Gnd
13	LED-R	3.3V	0V	Open
14	LED-W	0V	03.25	Open
15	PWM	Gnd	Gnd	0.961V

Stand By 5V

*** Pin 5 (Power Key) This pin is 0V when the button is lock “On” (In) and 5V when Locked “Off” (Out)**

Diode Mode Readings taken with all connectors Disconnected. DVM in Diode Mode.

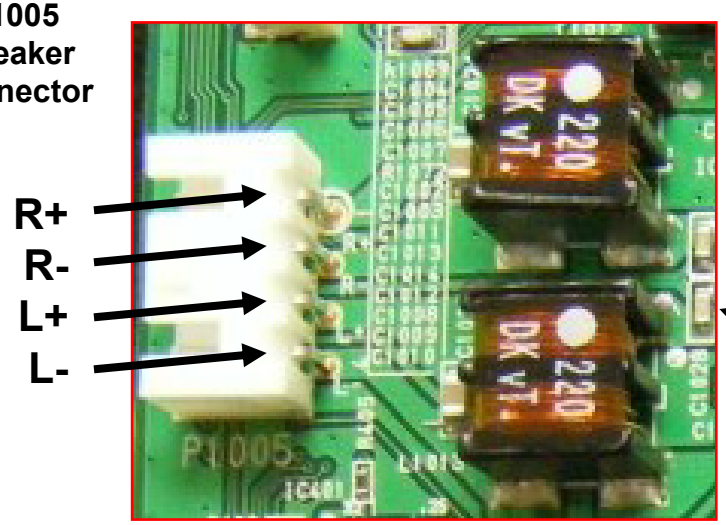
Main Board Speaker Plug P1005 Voltages and Diode Checks

P1005 CONNECTOR "Main" to "Speakers"

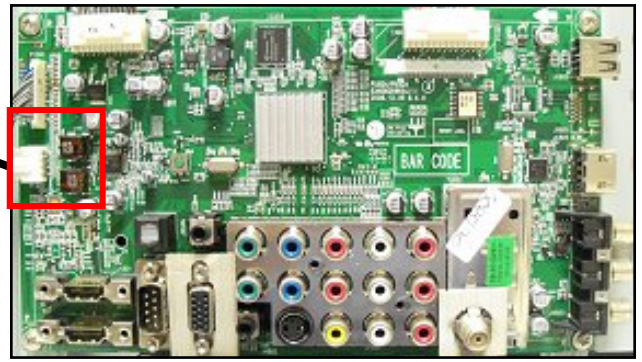
Pin	Label	SBY	Run	Diode Mode
1	R+	0V	8.65V	Open
2	R-	0V	8.65V	Open
3	L+	0V	8.65V	Open
4	L-	0V	8.65V	Open

Speakers are 8 Ohms

P1005 Speaker Connector



MAIN BOARD



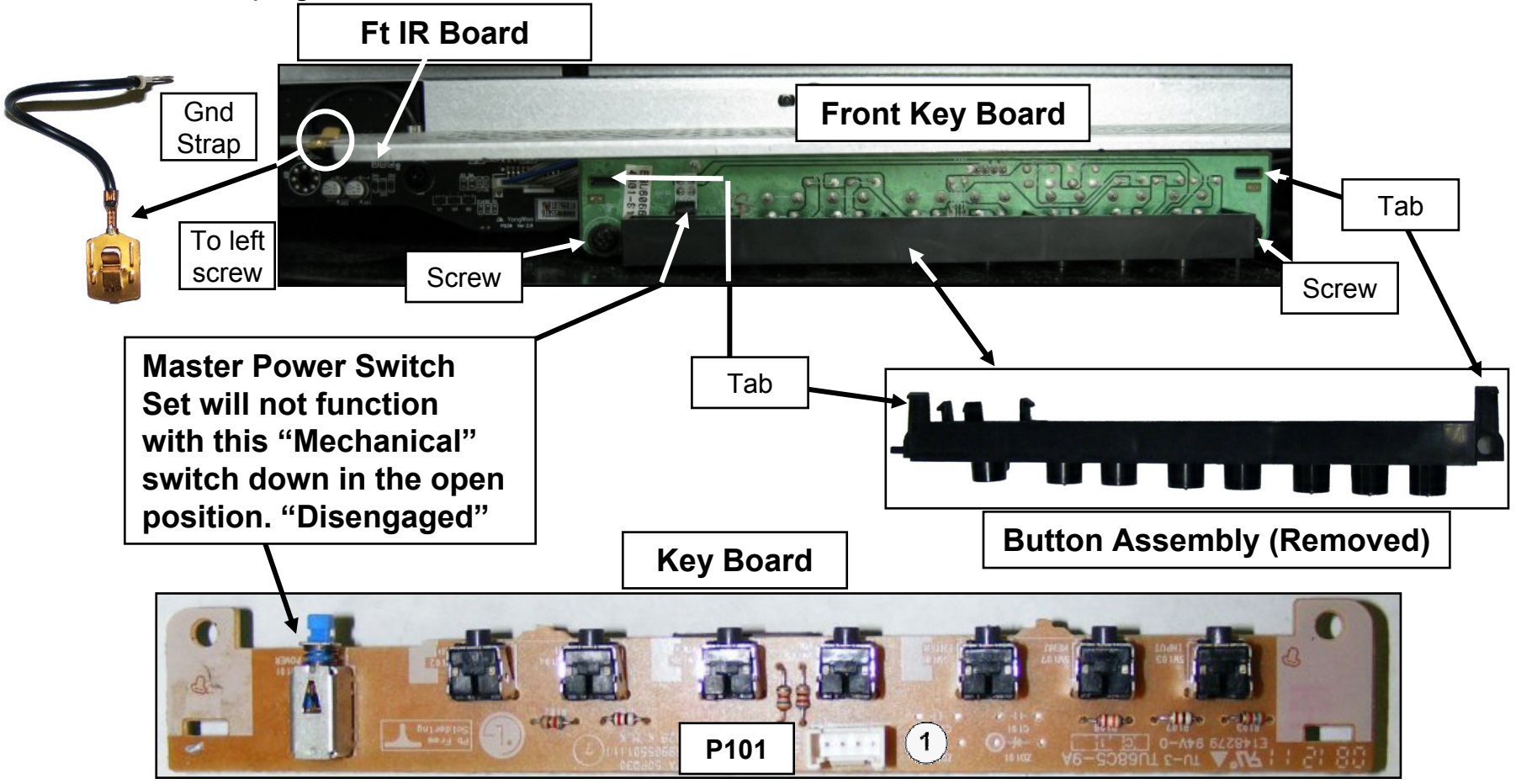
Diode Mode Readings with all Connectors Disconnected. DVM in the Diode mode.

FRONT CONTROL BOARD (IR and LED) KEY BOARD SECTION

Key Board Removal

The Key Board (with Power Switch) is located (as viewed from the rear) in the lower left hand section.

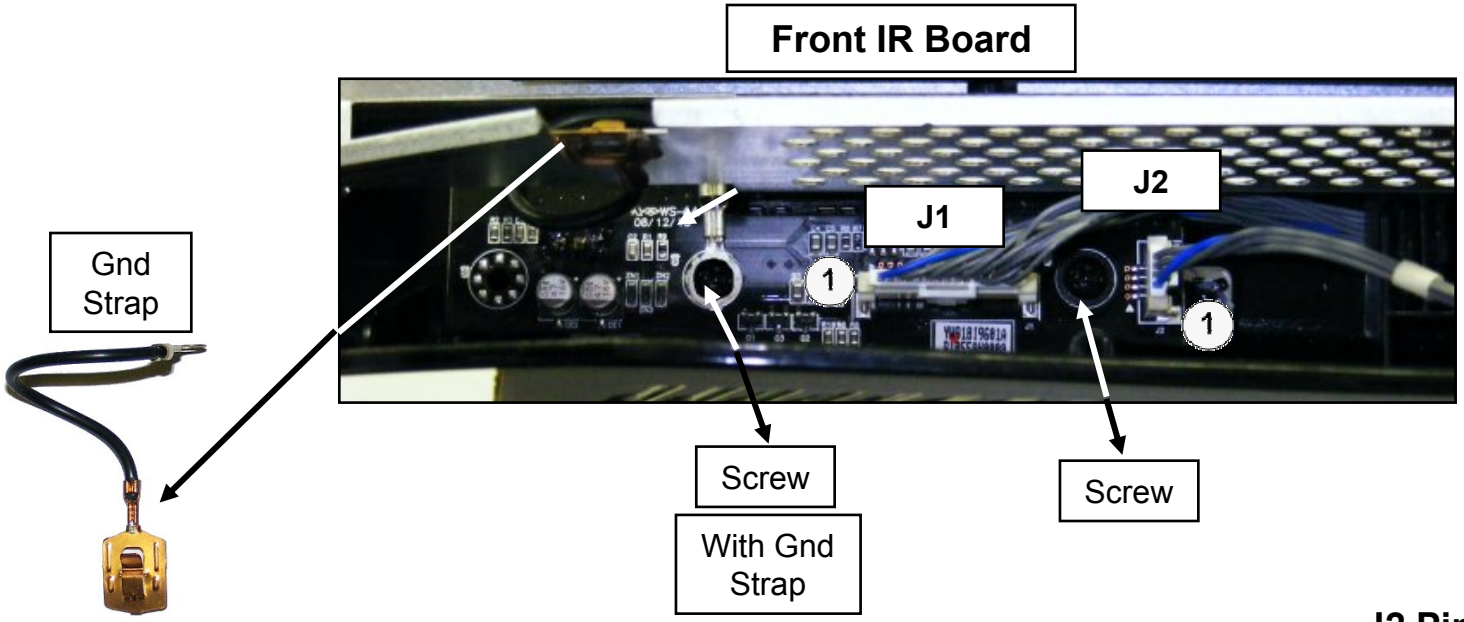
REMOVAL: Remove the 2 screws, push tabs inward while lifting upward on the board.
Unplug the connector P101.



Front IR and Power LED Board Removal

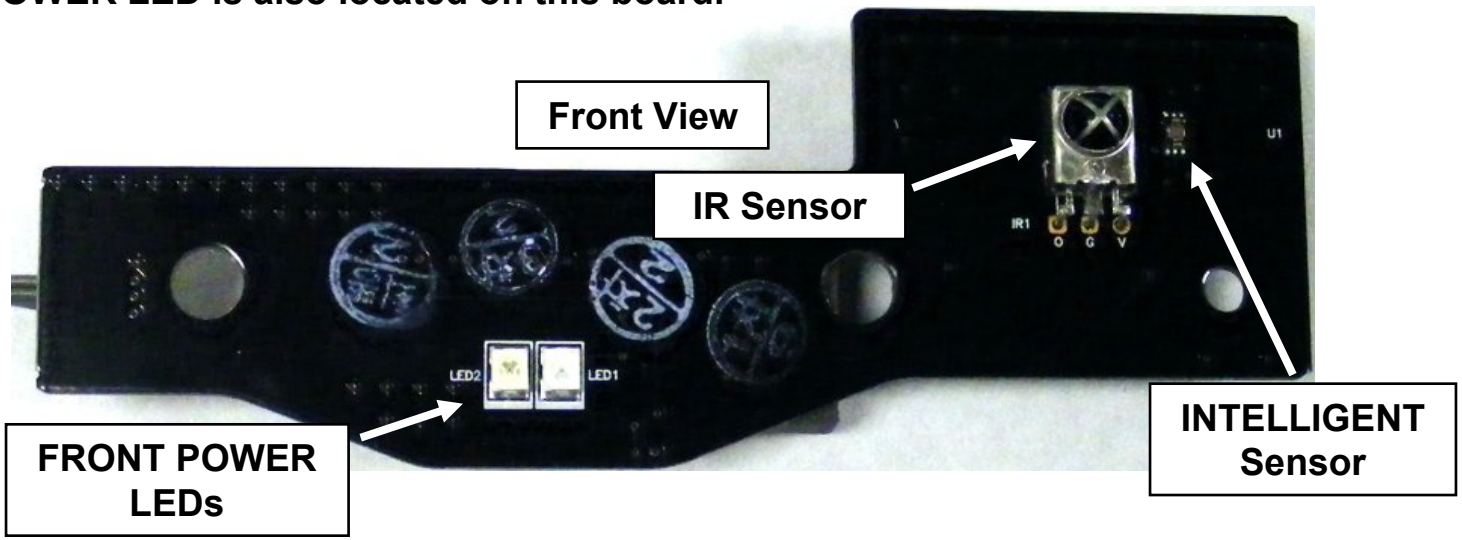
The (IR, LED and Intelligent Sensor) board is located (as viewed from the rear) in the lower left hand section.

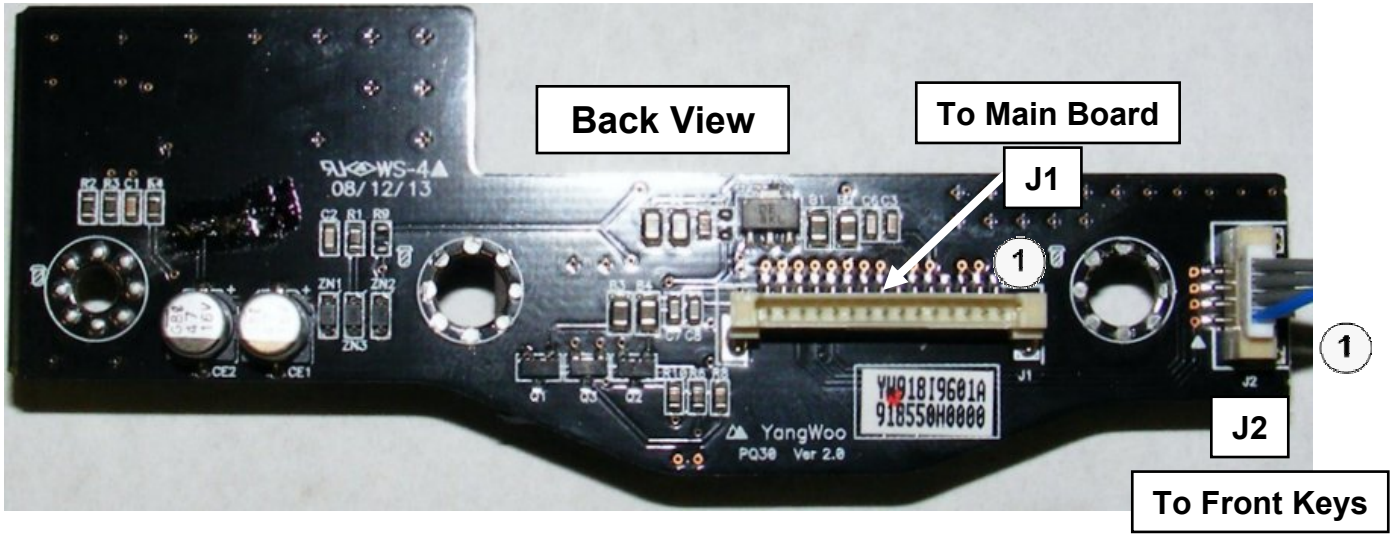
REMOVAL: Remove the 2 screws, pay attention to the Ground Strap on the left screw. Be sure to return this strap and IR problems may occur without it. Unplug the connectors J1 and J2.



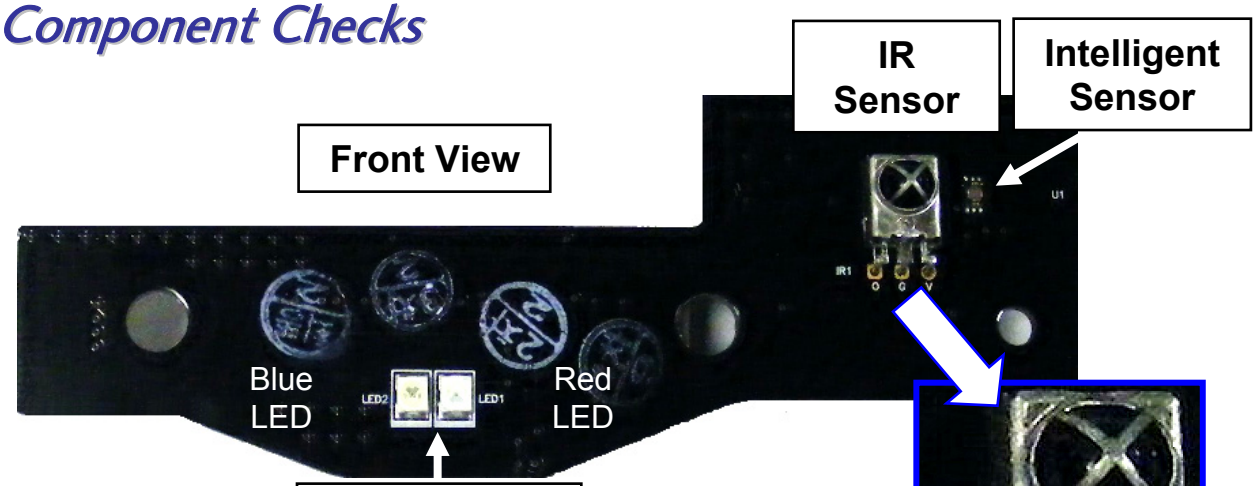
Ft Power LED (IR) Board Layout

The Ft Power LED board includes the IR Receiver and the Intelligent Sensor.
The Front POWER LED is also located on this board.

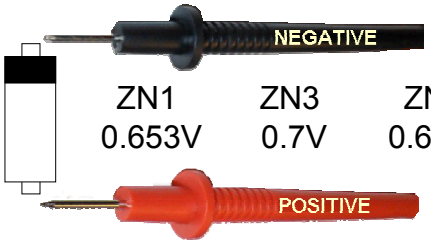




Ft Power LED (IR) Board Component Checks



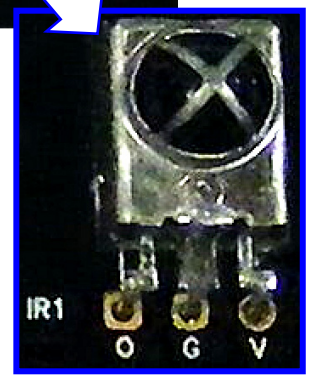
Place Voltmeter in Diode Mode.



ZN1 0.653V | ZN3 0.7V | ZN2 0.687V

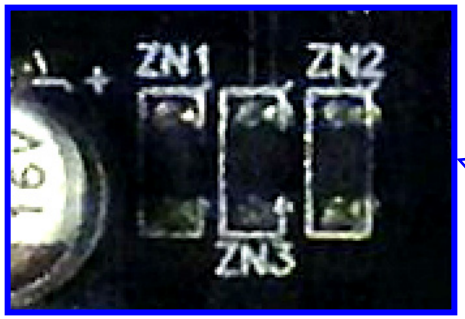
Leads opposite = Open

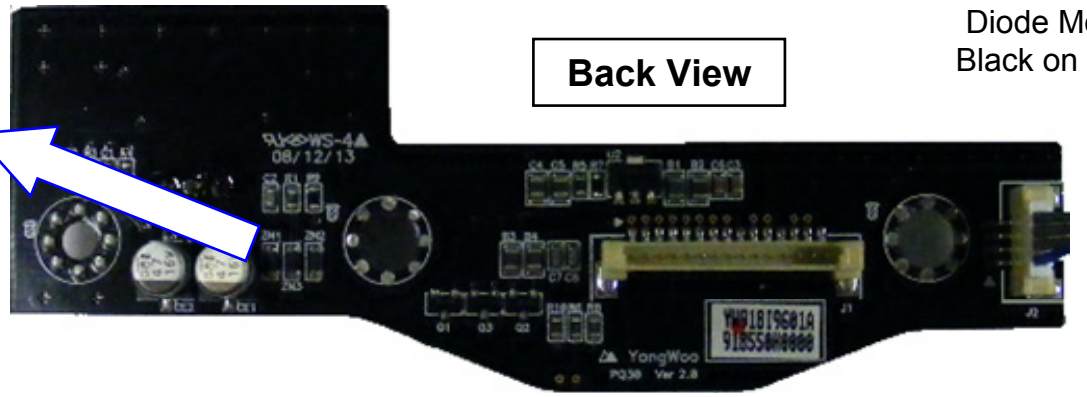
Place Voltmeter in Diode Mode, Red on bottom of either LED black lead on top and they light.



0.652V Gnd 0.652V

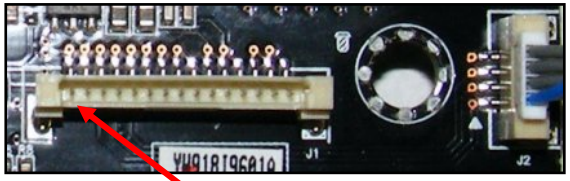
Place Voltmeter in Diode Mode. Black on Gnd.





Front LED Board Plug J1 to Main Voltages

Voltage and Diode Mode Measurements for the Main Board



J1 Pin
1

J1 CONNECTOR "FRONT IR" to "MAIN" P1001

Pin	Label	STBY	Run	Diode Mode
1	IR	4.8V	5V	3.2V
2	Gnd	Gnd	Gnd	Gnd
3	Key1	0V	3.3V	1.6V
4	Key2	0V	3.3V	1.6V
*5	P Key	0V *(5V)	0V	Open
6	Gnd	Gnd	Gnd	Gnd
7	EYE-SCL	0V	3.3V	2.5V
8	EYE-SDA	0V	3.3V	2.5V
9	Gnd	Gnd	Gnd	Gnd
10	5VST	5V	5V	1.06V
11	3.3VST	0V	5V	1.1V
12	Gnd	Gnd	Gnd	Gnd
13	LED-R	3.23V	0V	3.22V
14	LED-W	0V	03.23	Open
15	PWM	0V	0V	1V

Stand By 5V

*** Pin 5 (Power Key) This pin is 0V when the Main Power button is locked "On" (In) and 5V when it is locked "Off" (Out)**

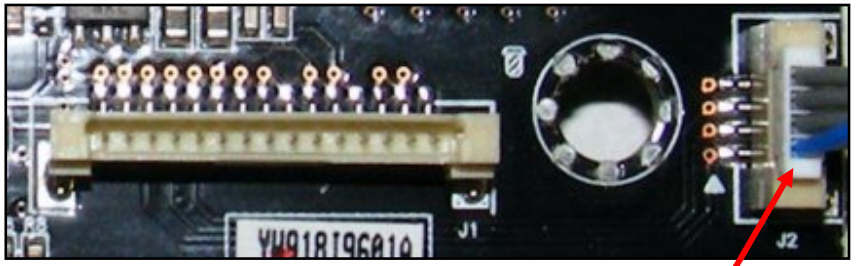
*** Pin 5 (Power Key) When this switch is out, Stand-By 5V turns off.**

Diode Mode Readings taken with all connectors Disconnected. DVM in Diode Mode.

Front IR Board Plug J2 to Key Board Voltages and Diode Check

Voltage and Diode Mode Measurements for the Main Board

*STBY1 Main Power Switch "OUT" Vacation



J2 Pin 1

J2 CONNECTOR "Ft LED Board" to "Ft Key Board"

Pin	LABEL	*STBY1	*STBY2	Run	Diode Mode
4	KEY 1	0V	0V	3.3V	Open
3	KEY 2	0V	0V	3.3V	Open
2	PWR SW	4.38V	Gnd	Gnd	Open
*1	Gnd	Gnd	Gnd	Gnd	*Open

* Use this pin for all readings.

*STBY2 Main Power Switch "IN" Normal

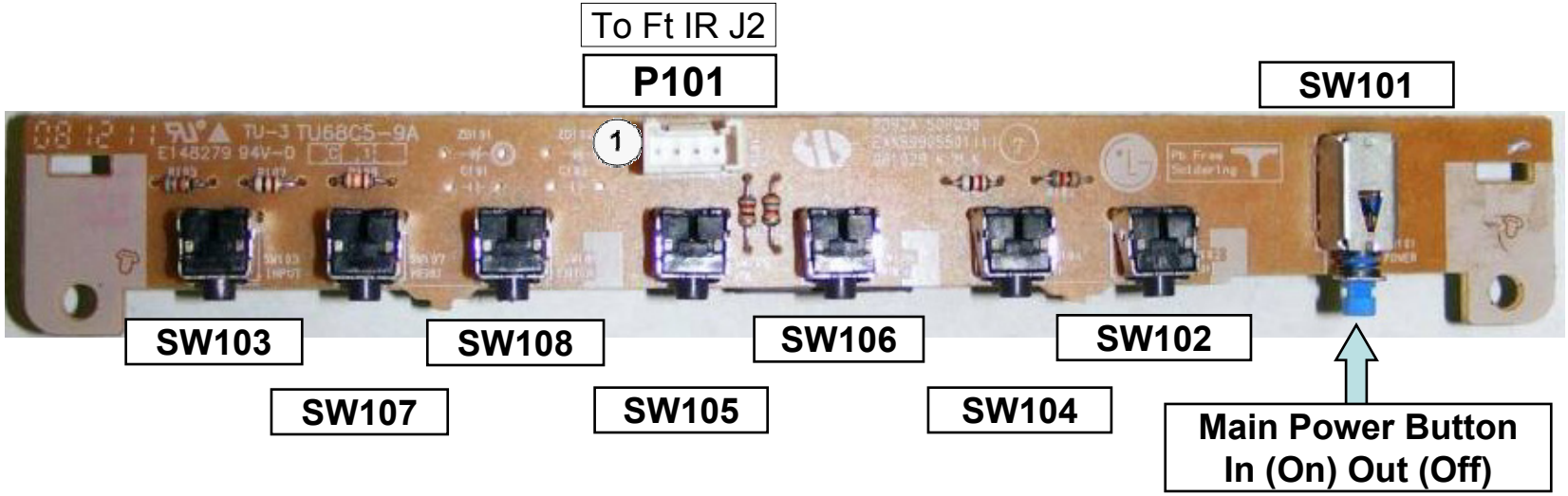
* This pin is open in reference to Chassis Ground.

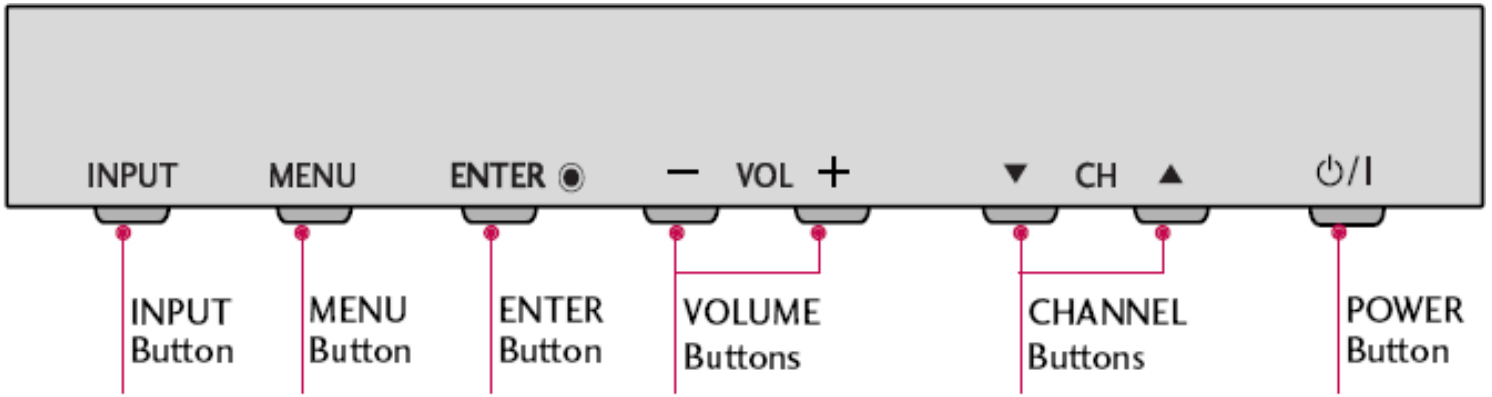
* Use this pin for Diode Mode readings.

Diode Mode Readings taken with all connectors Disconnected. DVM in Diode Mode.

SIDE KEY BOARD SECTION

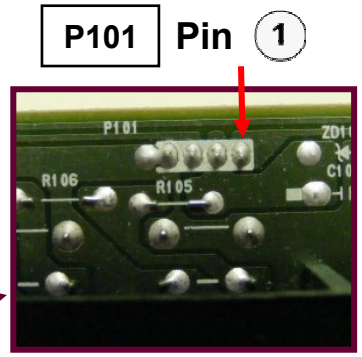
Side Key Board Layout (Component Identification)

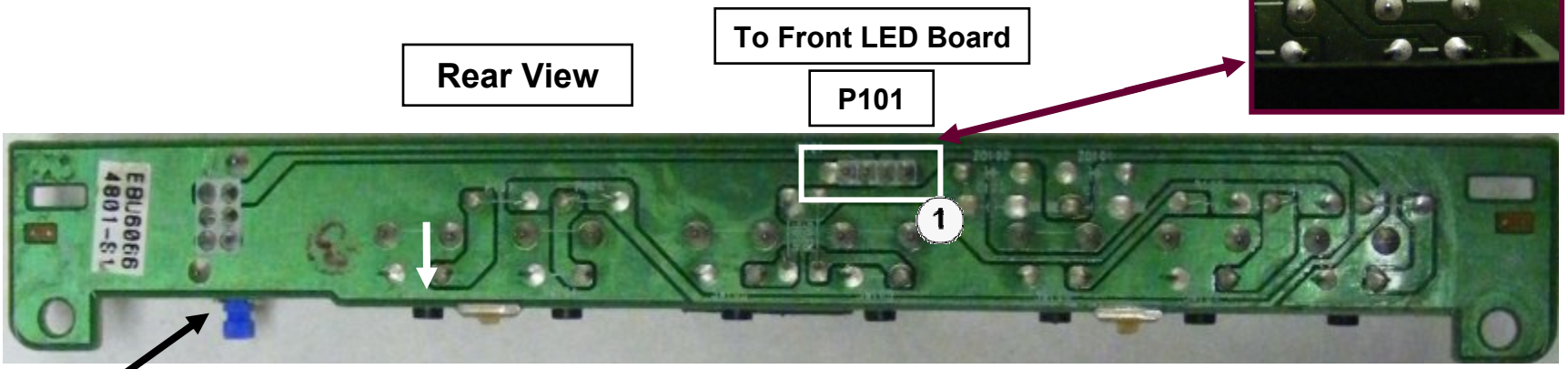


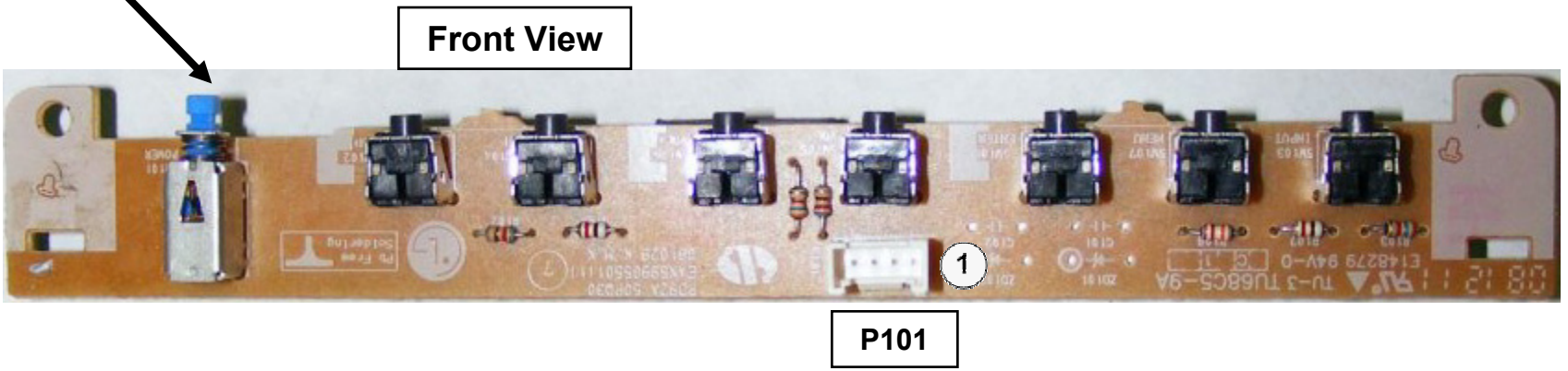


Side Key Board Layout

The Ft Key board contains the Master Power Switch, Volume Up/Down and Channel Up/Down keys. Also the Menu and Select keys.

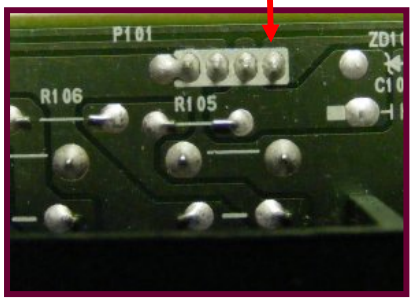






Side Key Assembly

P101 Pin 1



P101 Resistance Measurements with Key pressed.

KEY	Pin 4 measured from Pin 1		KEY	Pin 3 measured from Pin 1
CH (Up)	6K Ohms		Volume (+)	3.54K Ohms
CH (Dn)	9K Ohms		Volume (-)	0.62K Ohms
Input	3.5K Ohms		Enter	22K Ohms
			Menu	9K Ohms

P101 Voltage Measurements with Key pressed.

KEY	Pin 4 measured from Pin 1		KEY	Pin 3 measured from Pin 1
CH (Up)	0.19V		Volume (+)	0.86V
CH (Dn)	1.57V		Volume (-)	0.19V
Input	0.88V		Enter	2.2V
			Menu	1.56V

Diode Mode Readings taken with all connectors Disconnected. Black lead on Gnd. DVM in Diode Mode.

P101 Connector "Side Key" to "IR/LED Control Board" J2 (No Key Pressed)

STBY 1 Main Power Switch Out

STBY 2 Main Power Switch In

Pin	LABEL	*STBY1	*STBY2	Run	Diode Mode
*1	Gnd	Gnd	Gnd	Gnd	*Open
2	PWR SW	4.38V	Gnd	Gnd	Open
3	KEY 2	0V	0V	3.3V	Open
4	KEY 1	0V	0V	3.3V	Open

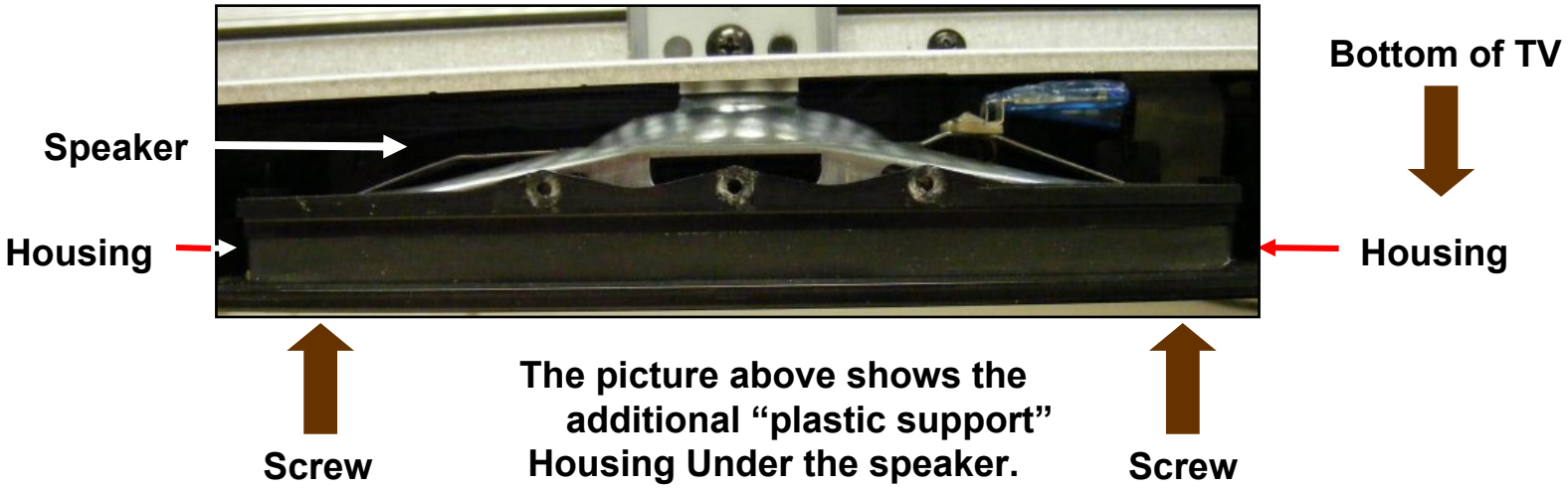
* This pin is open in reference to Chassis Ground.

* Use this pin for all readings.

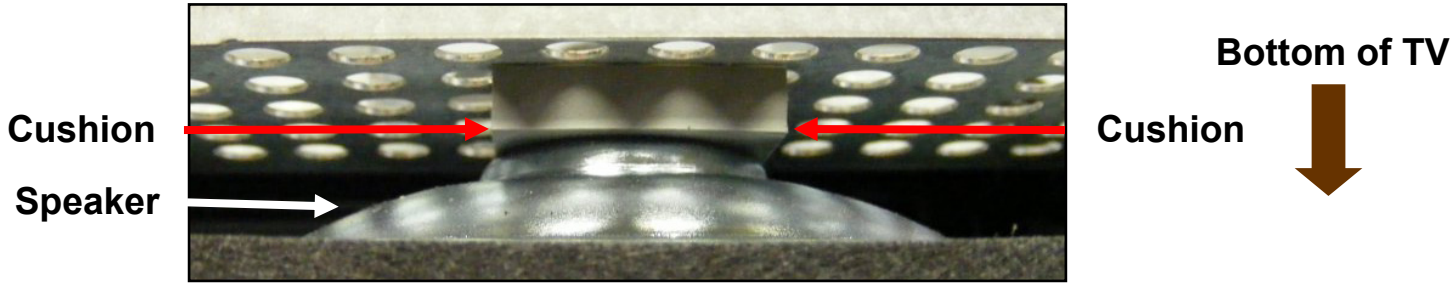
INVISIBLE SPEAKER SECTION

p/n: EAB58534501
Full Range 10W 8OHM 83DB 100HZ 160 X 55 X 31)

The Invisible Speaker System keeps the speaker grills off the front of the TV.
The speakers actually point downward.



The picture above shows the additional "plastic support" Housing Under the speaker.



At the top of the speaker is a rubber cushion.
Be sure to return this to its proper position to prevent vibrations.

Floating Ground checks must be made from Floating Ground. Use any pin on P204, P203, P205 or P208.

TIP:

SYMPTOM:
The panel indicates a brief flash during start up, then "No Picture" symptom.

CHECKS:

1. **Z-SUS does not produce a correct signal. (All voltages check normal except 17V).**
2. **Y-SUS does not produce a correct signal. (No negative portion).**
3. **On Y-SUS: 17V starts off at 17V then very quickly drops to 5V.**
4. **Floating Ground 5V and 15V are not produced.** *(See pages 60~61 for more details).*
5. **Removing all connectors on the Z-SUS board (Except the panel connectors) does not change test results.**
6. **Removing Y-Drive boards cause all voltages to return to normal. Including the Y-Drive signal checked on the right side of C213.**
7. **Reconnecting all connectors on the Z-SUS board shows it is not creating a correct waveform. Just spikes. (17V now stays up).**
8. **Using the Diode Checks for the Y-Drive boards do not indicate a problem.** *(See pages 67, 70, 71 and 74 for more details).*

FIX:
Replacing the Z-SUS board fixed the problems.

No Remote Function Service Tip:

TIP:

SYMPTOM:

When the set turns on and a picture appears, the bottom of the picture shows the Input selection screen.

The Remote did not work.

The Front Function Keys did not work. (Except the Main Power Switch).

CHECKS:

1. **Main Board: Reading the Key 1 and Key 2 lines found that Key 2 was at 0.8V. Key 1 read normal at 3.3V.** *(See page 124 for more details).*
2. **Feeling the Function buttons found that the right hand button (as viewed from the rear) did not feel the same as the others. It was stuck.**

FIX:

1. **Removing and repositioning the button assembly freed up the button. The set return to normal function.** *(See page 116 for more details).*

Checking the Y-Drive Upper or Lower Board Tip:

TIP:

SYMPTOM:

Set shuts down at turn on.

CHECKS: *(See pages 67, 70, 71 and 74 for more details).*

1. **V-Scan signal input to Lower Y-Drive board low ohms or low volts (Diode Mode).**
2. **Output from any buffer shows low ohms or low volts (Diode Mode).**

FIX: Found Defective Y-Drive Upper or Lower (See the Y-Drive section for checks)

1. **After determining which Y-Drive board is defective using the checks shown in the Y-Drive section, the other board can be tested separately.**
   - *If the Upper Y-Drive is found defective, the Lower Y-Drive board can be tested. Remove the Upper Y-Drive. Disconnect the Connector P209. Turn on the set and confirm that the bottom half of the picture looks normal.*
   - *If the Lower Y-Drive is found defective, the Upper Y-Drive board can be tested. Remove the Lower Y-Drive. Disconnect the Connector P209.*
     - *Jump either Pin 1 or 2 of P207 (V-Scan from the Y-SUS) to pin 4 or 5 of connector P108 on the Upper Y-Drive board.*
   - *Turn on the set and confirm that the top half of the picture looks normal.*

½ of the Picture is missing Top or Bottom Tip:

TIP:

SYMPTOM:

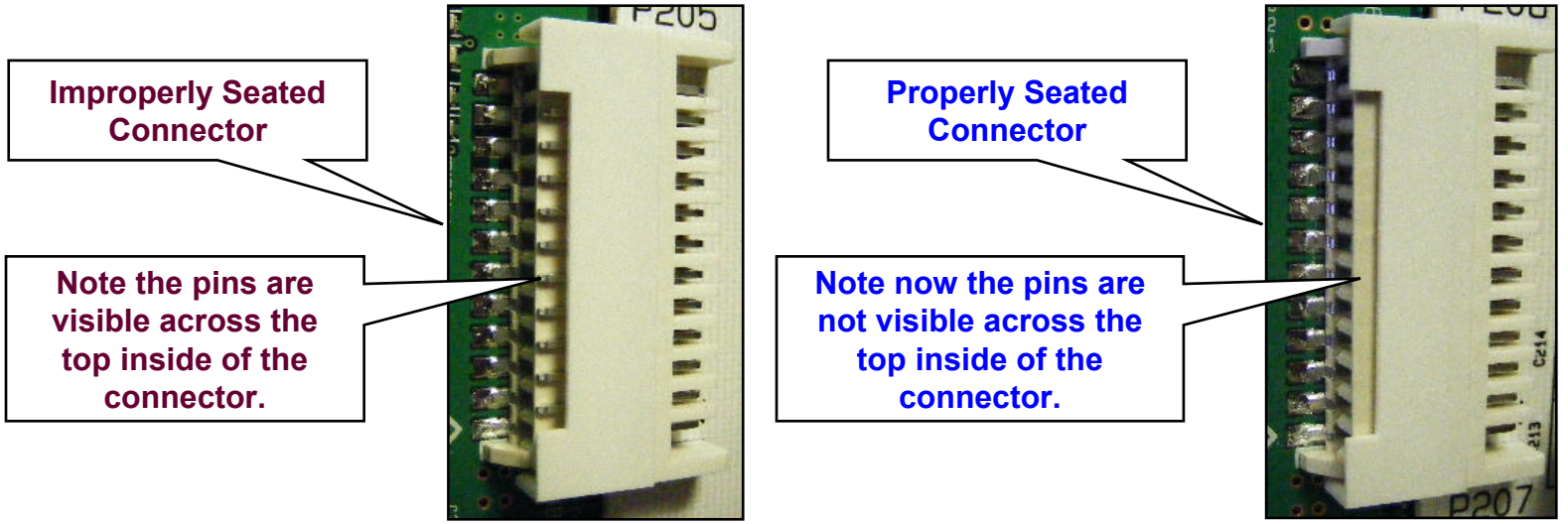
When the set turns on, either the Top or Bottom ½ of the picture is black. It is possible that the whole picture could be black if P207 or P207(Y-SUS) is involved.

CHECKS:

1. **Look careful the connections between the Y-SUS and Upper and Lower Y-Drive boards. It is very possible that the can be improperly seated.**

FIX:

1. **Remove and reseat the board correctly.**
2. **Note: This can happen if either the Y-SUS or Y-Drive boards are replaced or pulled off to perform checks.**



11 X 17 Foldout Section

This section shows the 11X17 foldout that's available in the Adobe version of the Training Manual.

For Printing purposes, choose the 11X17 paper size.

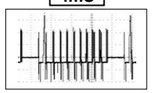
The Interconnect Diagram has a great deal of quick reference servicing aids. Use this in conjunction with the Training Manual.

50PQ30 (50G2 Panel) CIRCUIT INTERCONNECT DIAGRAM

NOTE: Diode tests are conducted with the PWB disconnected.

VS to Z-SUS and Error Com from the Z-SUS ↔

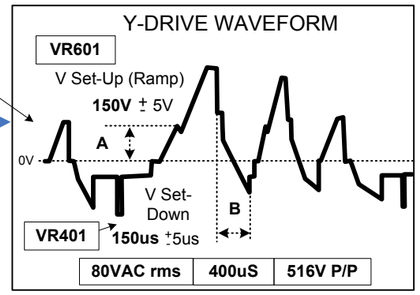
4mS



Waveform TP
On Y-Drive PWB

Note: Test points are not identified on the board. Just above P108 Just below P109

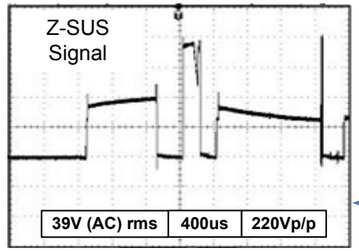
Y-DRIVE WAVEFORM



80VAC rms	400uS	516V P/P

Connect Scope between Waveform TP on Y-Drive and Gnd
Use RMS information just to check for board activity.

Z-SUS Signal



39V (AC) rms	400us	220Vp/p

Connect Scope between Waveform TP on Z board and Gnd
Use RMS information just to check for board activity.

P811 SMPS

Pin	Label	Diode
9,10	M5V	2V
8	Gnd	Gnd
6-7	*Va	Open
4-5	Gnd	Gnd
3	nc	nc
1~2	*Vs	Open

* (Vs) (Va) Varies according to Panel Label

P206 Y-SUS

Pin	Label	Run	Diode
1~2	M5V	5.1V	0.86V
3~6	Gnd	Gnd	Gnd
7	n/c	n/c	n/c
8~9	ER_COM	*90V	Open
10	n/c	n/c	n/c
11~12	Vs	*193V	Open

P201 Y-SUS

Pin	Label	Run	Diode
1-2	Vs	*193V	Open
3	nc	nc	nc
4-5	Gnd	Gnd	Gnd
6-7	Va	*60V	Open
8	Gnd	Gnd	Gnd
9,10	M5V	5.1V	0.86V

*Varies according to Panel Label

P813

Pin	Label	STBY	Run	No Load
1, 2	17V	0V	17V	17V
3, 4	Gnd	Gnd	Gnd	Gnd
5, 6	12V	0V	12V	12V
7, 8	Gnd	Gnd	Gnd	Gnd
9~11	5V	5V	5V	5V
12	Stby 5V	5V	5V	5V
13, 14	13, 14	Gnd	Gnd	Gnd
15, 16	15, 16	Gnd	Gnd	Gnd/nc
17	5V Det	0V	4.8V	5V
18	AC Det	4.6V	4.5V	5V
19	RL On	0V	3.3V	0V
20	Vs On	0V	3.3V	0V
21	M5 On	0V	3.3V	0V
22	Auto Gnd	0V	0V	5V
23	Stby5V	5V	5.1V	5V
24	Key On	0V	0V	5V

17V turns on with Vs On command
12V turns on with RL On command
5V turns on with RL On command
5V Det from SMPS when 5V (9~11) turns on
Step 1
Step 3
Step 2

R502 VA Adj
VS Adj R901

SMPS POWER SUPPLY

SC101 A/C IN
5.1V Main Power SW Out
Stand-By 5V shuts off
P813

SMPS Test – Unplug P813, ground pin 24. If all supplies do not run when A/C is reapplied, disconnect P811 to isolate the excessive load. Use two (100W) light bulbs in series connected between Vs and Gnd to test under a load.

P100

Pin	Label	Run
1	Gnd	Gnd
2	Z Enable	0.05V
3	Z Bias	1.8V
4	Z Ramp	1.7V
5	Gnd	Gnd
6	Z ER Up	0.3V
7	Z ER Dn	0.4V
8	Z SUS Up	0.2V
9	Z SUS Dn	0.8V
10	Gnd	Gnd
11	+15V	17V
12	+15V	17V

P101
1~2) +5V (5.1V)
3~6) Gnd
7) n/c
8~9) ER_COM (90)
10) n/c
11~12) +Vs

* (Vs) Variable according to Panel Label

Main Front Side Regulators

IC302 1.3V VDDC REG	IC804 USB POWER
1) 5.4V 5) 0.9V	1) 5V 4) 0V
2) 4.95V 6) 0.9V	2) Gnd 5) 0V
3) 1.3V 7) 4.9V	3) 3.3V 6) 5V
4) Gnd 8) 3.6V	

Main Back Side Regulators

IC201 NV RAM	IC202 HDCP	IC602, IC802
1,2) Gnd	1,2) Gnd	1) 5V
3,4) Gnd	3) 3.29V	2) 4.6V
5,6) 3.29V	4) Gnd	3) 4.6V
7) Gnd	5,6) 3.29V	4) 3.3V
8) 3.29V	7) Gnd	5,6,7,8) Gnd
	8) 3.3V	

To run the Z-SUS without the Y-SUS, jump VS from the SMPS to pin 11 or 12 P101.
Jump M5V to pin 1 or 2 P101.
Jump Audio 17V from SMPS to pin 11 or 12 of P100.
Jump M5V to the Control Board.

Y-Drive Upper

FPC P101 P102 P103 FPC

P209
12) FGnd
11) OC2
10) DATA
9) OC1
8) STB
7) Clk
6) FGnd
5) FG 5V
4) FG 5V
3) FGnd
2) FGnd
1) FGnd

P108
1) FGnd
2) FGnd
3) FGnd
4) n/c
5) VScan
6) VScan

P209
6) FGnd
5) FGnd
4) FGnd
3) n/c
2) VScan
1) VScan

Vscan (*134V) From FG

FG5V FL101
FG5V + side C105
C105
P106 P107 P108 P109
Floating Gnd
P204 P203 P205
P201 P208
P206 C205 C214 C213 FL201 FG5V
P207 P202 P205
Y-Drive Lower

P209 P204 P206 P201 P203 P205 P207 P202

VR601 SET-UP

Y-SUSTAIN

FS202 4A/250V
Diode Check Open (In Circuit)
FS201 10A/125V M5V
Diode Check 0.79V (In Circuit) 1.2V (No Connectors)
-Vy TP R201
VR501 VSC
D503
D502 T501 IC503 IC502 VR502 -Vy
VR401 SET-DN
VSC TP R202
Q503 D501 IC303 T502 17V
FS501 (17V) 125V/4A
Diode Check 1.33V
FS201 10A/125V Va
Diode Check Open
P101

12) Vscan (134V)
11) VScan (134V)
10) n/c
9) FG5V (5V)
8) FG5V (5V)
7) FGnd
6) Clk (0.9V)
5) STB (2.3V)
4) OC1 (2.2V)
3) DATA (0V)
2) OC2 (2.9V)
1) FGnd

P202 / P122

Pin	Label	Run	Diode Check
1~3	Gnd	Gnd	Gnd
4	n/c	n/c	n/c
5~7	*Va	60V	Open

*Varies according to Panel Label

To Check FG5V to the Y Drive, measure across capacitor C205
The voltage is supplied thru FL201.
All Y-Drive voltages measured from FGnd.

Va

P101 (Side Key) to J2 (Ft IR)

Pin	Label	Run	Diode Check
1	Gnd	Gnd	Gnd
2	Gnd	Gnd	Gnd
3, 4	Key	3.3V	Open

Note: IC221 (3.3V Regulator) routed out P162 (56~60) to Center X Board

M5V Gnd Gnd M5V

IC221
Pin 1 (Gnd)
Pin 2 (3.3V)
Pin 3 (4.95V)

1~3) 17V
4~7) 5V

15V and 5V

FL111 FL112 5V Fuses

Ribbon Cable → Pin 1~3 (17V) Pin 4~7 (M5V)
← Y-SUS and Y Drive Signals

FL111 FL112 P131 P121 IC221 IC141 IC211 IC231 IC241 X101 25 Meg CONTROL PCB IC201 Auto Gen D201 P111 P101 P161 P162

IC231
Pin 1 (Gnd)
Pin 2 (3.3V)
Pin 3 (4.95V)

IC141
Pin 1 (3.3V)
Pin 2 (0V)
Pin 3 (3.3V)
Pin 4 (Gnd)
Pin 5 (3.3V)
Pin 6 (0V)
Pin 7 (3.3V)
Pin 8 (0V)

IC211
Pin 1 (5V)
Pin 2 (1.8V)
Pin 3 (Gnd)

IC241
Pin 1 (0.8V)
Pin 2 (Gnd)
Pin 3 (4.96V)
Pin 4 (5.74V)
Pin 8 (3.3V)
Pin 7 (Gnd)
Pin 6 (Gnd)
Pin 5 (4.91V)

Software Upgrades n/c

← LVDS

To Test Control board: Unplug all connectors. Jump 5V from SMPS (P813 pin 23) to pin 1 of IC211. Observe LED. If it blinks, most likely Control PWB is OK. FL111 and FL112 should be checked.
To check M5V route, disconnect P201 from the Y-SUS Board and connect a Jumper from Pin 1 of P811 (M5V) to Pin 10 P201 (5V).

The 5V is then routed to the Control Board via FS201, Ribbon Cable P101 on the Y-SUS to P111 and FL111 and FL112 on the Control Board for Control Board operation verification. Watch D201 for blinking to confirm.

Short across the two points labeled Auto Gen to generate a test pattern. (Note: Must Remove LVDS Cable).

* If the complaint is no video and shorting the points (AutoGen) causes video to appear suspect the Main board or LVDS cable.

With the unit on, if D201 does not blink on/off, check 5V supply.
If present replace the Control PCB.
If missing, see (To Test Control Board)

From Pin 2 IC221 (3.3V) P162 Pins 56~60

Ribbon Cable

Ribbon Cable

X-Drive RGB Signals

3.3V

Z-Drive Signals

17V

Diode Check Open (In Circuit)
VZB TP Top Side R271 or R272 To J125
P101 FS100 Vs fuse FS102 250V/4A J125 FPC
FS100 125V/10A (M5V)
VZB Adj VR200
P104
Z-SUS PWB
Z Bias Waveform
J27
L200
P105 FPC
P100
FS101 125V/4A (15V)
P103
Diode Check 1.354V (In Circuit)
To Z-SUB P301

LVDS

To FT IR J1
IR J2 goes to Keys P101

To Speakers (All Pins 8.5V)

P1001 P1006 P1003 LVDS IC804 USB
LVDS Processor IC203
Micro/Video Processor IC1
MAIN BOARD
IC301 IC302 IC303 IC304 IC305 IC201 IC202 IC204 IC501 IC502 IC503 IC504 IC601 IC602 IC803 IC804
Q301 Q303 Q501 Q502 Q504 Q601 Q801 Q802 Q890 Q891 Q892 Q1001 Q1002
D201 D501 D502 D601 D628 D804 D805 D806
IC503 9V Reg
IC1001 Audio Amp
SW301 Reset IC1
L318 L1012 L1013
X1 12Mhz X501 25Mhz
USB HDMI
TUNER
ZD601
Grayed Out ICs are located on Back

	IC301 3.3VST Reg	IC304 1.8VMST Reg	IC305 3.3VMST Reg	IC502 1.2VPVSB Reg On = Digital CH	IC503 Tuner 9V Reg	IC505 Tuner 5V Reg
1	Gnd	0.6V	Gnd	Gnd	12V	3.8V
2	3.3V	1.85V	3.0V	In 0V/3.3V	Gnd	5.0V
3	5V	3.3V	4.9V	Out 0V/1.2V	8V	8V

TUNER TU501 TDVW-H103F

P1001

Pin	Label	STBY	Run	Pin	Label	STBY	Run	Pin	Label	STBY	Run	Pin	Label	STBY	Run
1	IR	4.8V	4.8V	5	*PKEY	0V	0V	9	Gnd	Gnd	Gnd	13	LED R	3.23V	0V
2	Gnd	Gnd	Gnd	6	Gnd	Gnd	Gnd	10	5VST	5V	5V	14	LED W	0V	3.23V
3	Key 1	0V	3.3V	7	EyeSCL	0V	3.3V	11	3.3VST	0V	5V	15	PWM	0V	0V
4	Key 2	0V	3.3V	8	EyeSDA	0V	3.3V	12	Gnd	Gnd	Gnd				

**PKEY (pin 5) Normal 0V. If 5V Main Power Switch is Open. STBY5V turns off.*

P122 X-Drive RGB Signals

X-Board Left

P121 3.3V in on Pins 10~11
P121 Va out on Pins 1~4
P101 P102 P103 P104 P105

Va
3.3V
P212 3.3V out Pins 39~40
P212 Va in Pins 46~50

X-Board Center

P231 3.3V is not routed through this connector
P232 3.3V in on Pins 1~5
P211 Va out on Pins 1~4
P211 3.3V out On Pins 12, 5~6
P201 P202 P203 P204 P205 P206

X-Drive RGB Signals

Va
3.3V
P331 Va in on Pins 47~50
P331 3.3V in on Pins 38, 43, 44

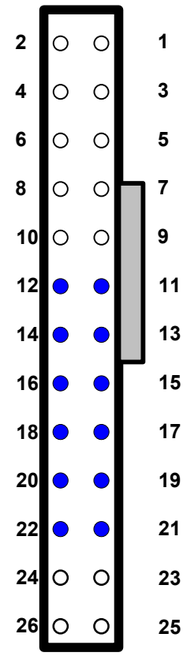
X-Board Right

P301 P302 P303 P304 P305

50PQ30 LVDS P1003 WAVEFORMS

Connector P1003 Configuration

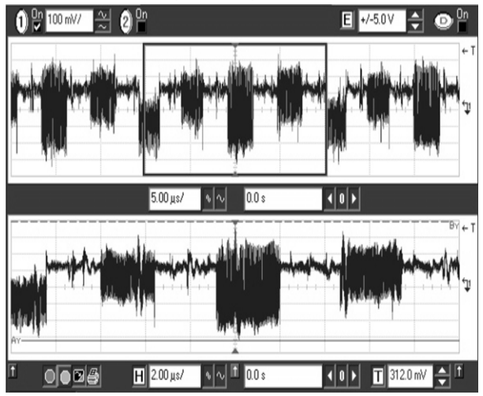
● indicates signal pins.



NOTE: LVDS P1003 Information
There are actually 12 pins carrying Video 2 pins are carrying clock signals (17 and 18) to the Control board. With high activity video, pins 21 and 22 would have signals present.

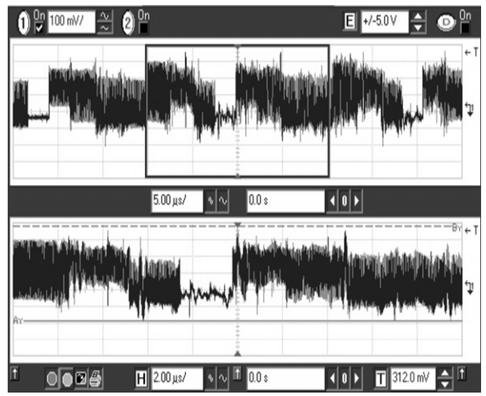
WAVEFORMS:
Waveforms taken using SMTP Color Bar input. All readings give their Time Base related to scope settings.
All waveforms taken from the P1003.

P1003 LVDS (Pin 11) 5uSec / 718mV



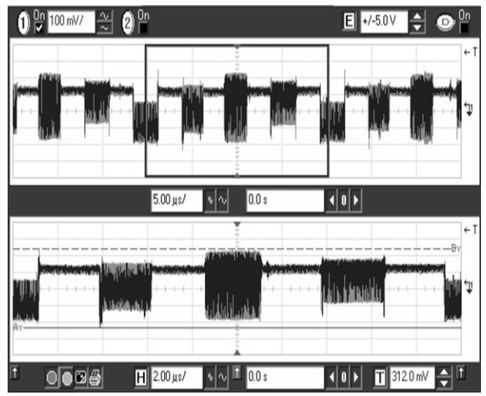
P1003 LVDS (Pin 11) 2uSec / 718mV

P1003 LVDS (Pin 12) 5uSec / 565mV



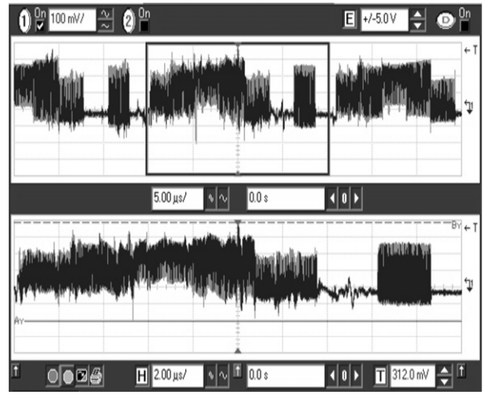
P1003 LVDS (Pin 12) 2uSec / 565mV

P1003 LVDS (Pin 13) 5uSec / 479mV



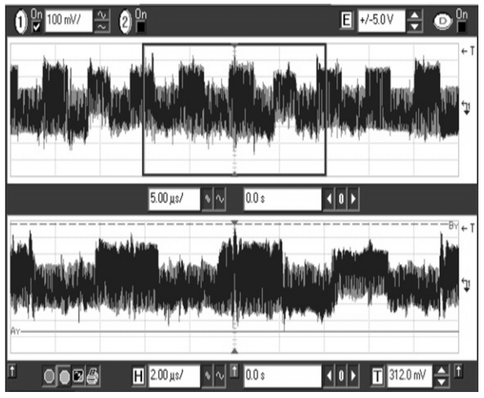
P1003 LVDS (Pin 13) 2uSec / 479mV

P1003 LVDS (Pin 14) 5uSec / 594mV



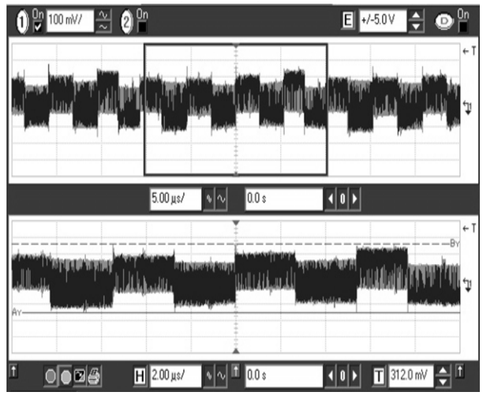
P1003 LVDS (Pin 14) 2uSec / 594mV

P1003 LVDS (Pin 15) 5uSec / 648mV



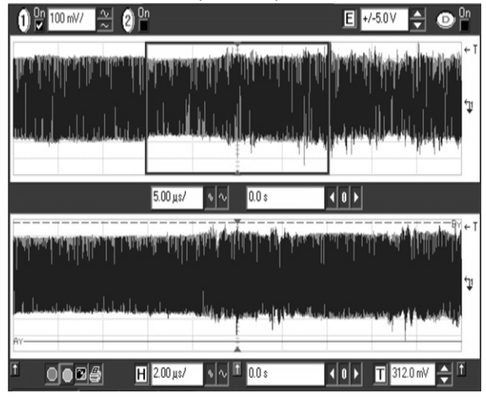
P1003 LVDS (Pin 15) 2uSec / 648mV

P1003 LVDS (Pin 16) 5uSec / 414mV



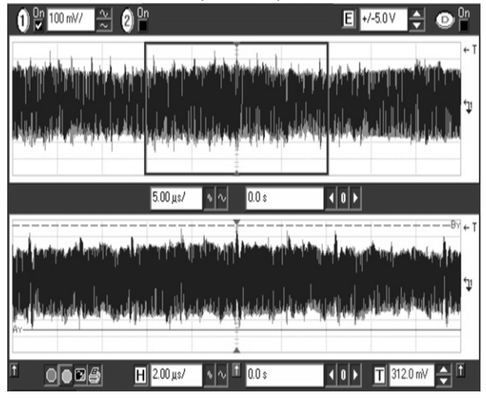
P1003 LVDS (Pin 16) 2uSec / 414mV

P1003 LVDS (Pin 17) 5uSec / 717mV



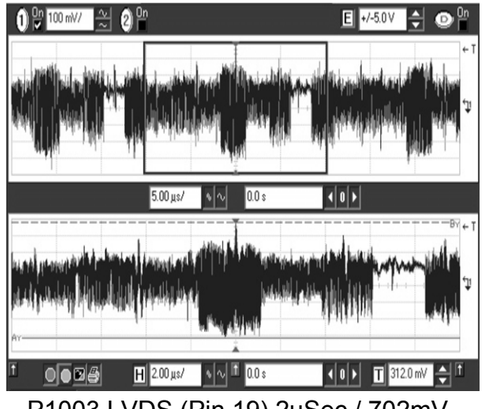
P1003 LVDS (Pin 17) 2uSec / 717mV

P1003 LVDS (Pin 18) 5uSec / 624mV



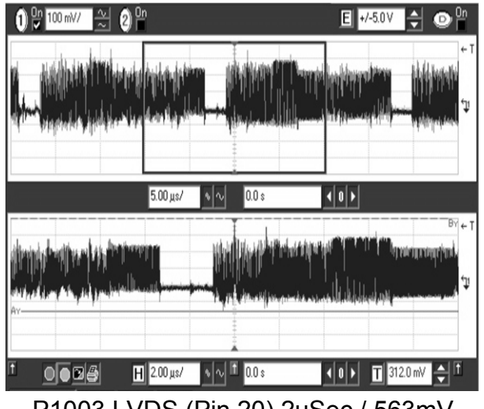
P1003 LVDS (Pin 18) 2uSec / 624mV

P1003 LVDS (Pin 19) 5uSec / 702mV



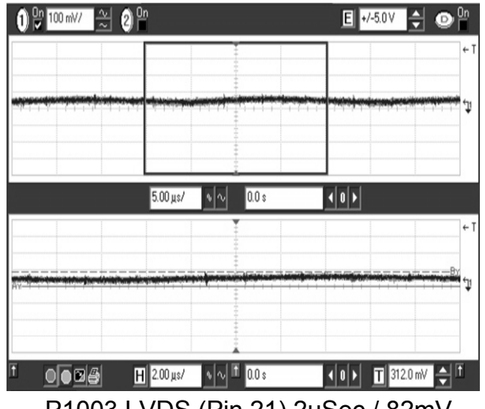
P1003 LVDS (Pin 19) 2uSec / 702mV

P1003 LVDS (Pin 20) 5uSec / 563mV



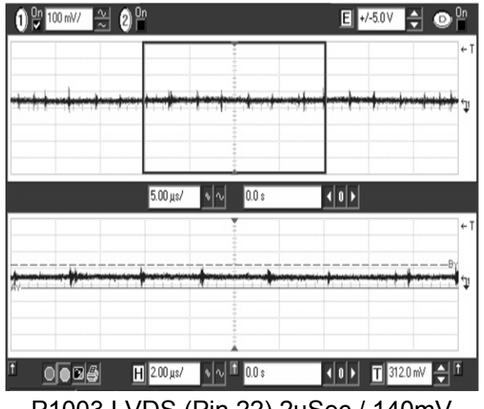
P1003 LVDS (Pin 20) 2uSec / 563mV

P1003 LVDS (Pin 21) 5uSec / 82mV



P1003 LVDS (Pin 21) 2uSec / 82mV

P1003 LVDS (Pin 22) 5uSec / 140mV



P1003 LVDS (Pin 22) 2uSec / 140mV

50PQ30 MAIN (BACK SIDE) SIMICONDUCTORS

IC201 NVRAM



Pin	
[1]	Gnd
[2]	Gnd
[3]	Gnd
[4]	Gnd
[5]	3.28V
[6]	3.28V
[7]	0V
[8]	3.28V

IC202 HDCP



Pin	
[1]	Gnd
[2]	Gnd
[3]	3.28V
[4]	Gnd
[5]	3.28V
[6]	3.28V
[7]	0V
[8]	3.28V

IC301 5VST to 3.3V VST



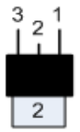
Pin	Reg
[1]	Gnd
[2]	3.3V
[3]	5.0V

IC304 1.8VMST



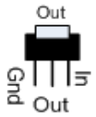
Pin	Reg
[1]	0.6V
[2]	1.85V
[3]	3.28V

IC305 3.3VMST



Pin	Reg
[1]	Gnd
[2]	3.3V
[3]	5V

IC502 1.2V PVSB
On Digital CH / Off Analog



Pin	Reg
Gnd	Gnd
In	0V/3.3V
Out	0V/1.2V

IC505 5V (Tuner)



Pin	Reg
[1]	3.8V
[2]	5V
[3]	8V

IC601 RS232 Control



Pin	
[1]	3.3V
[2]	5.4V
[3]	0V
[4]	0V
[5]	(-5.57V)
[6]	(-5.56V)
[7]	(-5.56V)
[8]	0V
[9]	3.3V
[10]	3.3V
[11]	n/c
[12]	n/c
[13]	n/c
[14]	5.6V
[15]	0V
[16]	3.3V

IC602 RS232 RAM



Pin	
[1]	Gnd
[2]	Gnd
[3]	Gnd
[4]	Gnd
[5]	4.5V
[6]	4.5V
[7]	3.3V
[8]	4.5V

IC802/3 HDMI1/2



Pin	
[1]	Gnd
[2]	Gnd
[3]	Gnd
[4]	Gnd
[5]	4.6V
[6]	4.6V
[7]	3.3V
[8]	4.6V

D1001 For IC1001 3.3V



Pin	Speedup
A	3.27V
C	3.3V

Q1001 Pow Down



Pin	IC1001
[B]	0V
[E]	Gnd
[C]	3.3V

Q302 Reset



Pin	
[B]	3.3V
[E]	3.2V
[C]	0V

Q303 5V MST Switch



Pin	
[S]	4.9V
[G]	0V/4.9V
[D]	5V/0V

On Digital CH / Off Analog

Q501 3.3V VMST



Pin	Switch Ctl
[B]	0V/0.6V
[E]	0V
[C]	3.3V/0V

On Digital CH / Off Analog

D627 RS232 TX Noise



Pin	Suppression
A	(-5.3V)
C	0.1V
A	Gnd

Q502 Video Buffer



Pin	
[B]	0.6V
[E]	2.1V
[C]	Gnd

Q503 SIF Buffer



Pin	
[B]	2.3V
[E]	3.0V
[C]	Gnd

Q504 3.3V PVSB



Pin	Switch
[S]	3.3V
[G]	3.3V/0V
[D]	0V/3.27V

On Digital CH / Off Analog

Q601 RS232 TX



Pin	Buffer
[B]	0.6V
[E]	Gnd
[C]	0V

D628 RS232 RX Noise



Pin	Suppression
A	0V
C	0V
A	Gnd

Q890/2 HDMI1/2



Pin	Hot Swap
[B]	0V
[E]	Gnd
[C]	0V

Q891 HDMI3/4



Pin	Hot Swap
[B]	0V
[E]	Gnd
[C]	0V

D633 RGB B+



Pin	
A	0V
C	4.5V
A	5.0V

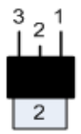
50PQ30 MAIN (FRONT SIDE) SIMICONDUCTORS

IC302 1.3V VDDC



Pin	
[1]	5.47V
[2]	4.89V
[3]	1.3V
[4]	Gnd
[5]	0.9V
[6]	1.19V
[7]	4.85V
[8]	3.55V

IC503 9V Reg



Pin	
[1]	12V
[2]	Gnd
[3]	8V

IC804 USB 5V



Pin	
[1]	5.0V
[2]	Gnd
[3]	3.2V
[4]	0V
[5]	0V
[6]	5.1V

IC805 HDMI3 EDID



Pin	
[1]	Gnd
[2]	Gnd
[3]	Gnd
[4]	Gnd
[5]	4.65V
[6]	4.65V
[7]	3.31V
[8]	4.65V

Q301 Turns on



Pin	Q303
[B]	0.54V
[E]	Gnd
[C]	0V

Q801 HDMI CEC



Pin	Amp
[1]	0V
[2]	3.16V
[3]	3.27V
[4]	3.28V

Q1002 Pow Down



Pin	IC1001
[B]	0.6V
[E]	Gnd
[C]	0V

D303 Reset



Pin	
A	3.18V
C	3.28V
C	3.28V

ZD601 Wired Remote T〉



Pin	Protect
A	3.27V
C	3.3V

D805 HDMI2 PWR



Pin	
A	5.1V
C	4.65V
A	0V

D806 HDMI3 PWR



Pin	
A	5.1V
C	4.65V
A	0V

This concludes the Presentation

Thank You

